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Distribution and Biogeography of the Recent Haliotidae (Gastropoda: Vetigastropoda) World-wide

Daniel L. Geiger

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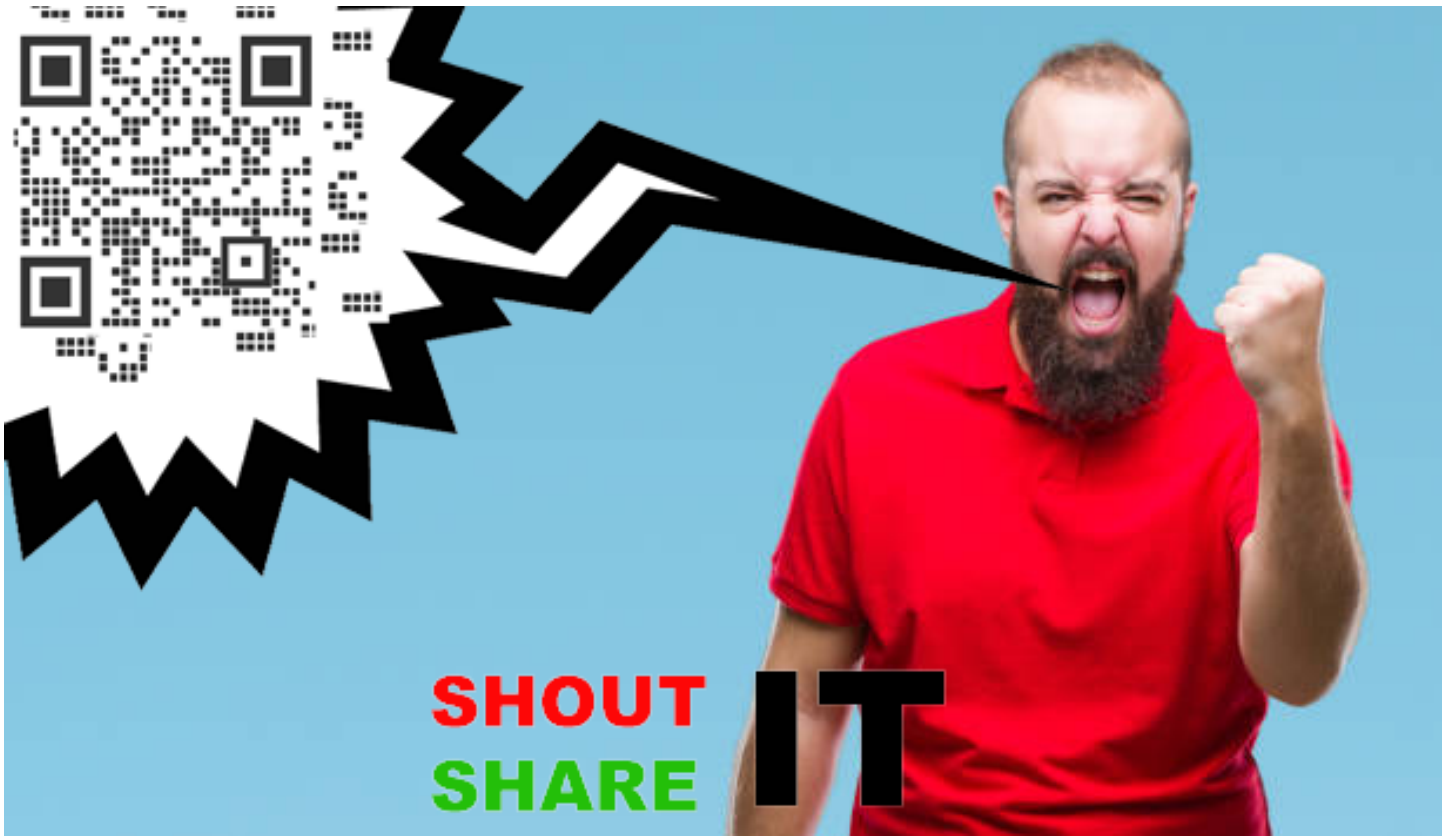
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Distribution and Biogeography of the Recent Haliotidae (Gastropoda: Vetigastropoda) World-wide

Daniel L. Geiger

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KEY WORDS: distribution, biogeography, *Haliotis*, area cladogram.

ABSTRACT: The distribution of all 56 abalone species is documented based on specimen records. The three models for the origin of the family (Pacific Rim, Indo-Pacific, Tethys) are evaluated. The area cladogram, which treats the distribution of the individual species as characters and the areas as taxa, is in general agreement with an unrooted phylogenetic tree of the taxa for which the geographic occurrence is superimposed. The basal node of the area cladogram is a fairly large polytomy uniting rather distant provinces such as the north Pacific, Australia, and Africa. A similar pattern emerges from the taxon cladogram. Accordingly, a very general Indo-Pacific origin emerges, best in agreement with the Indo-Pacific model for the origin of the family. The apparent discrepancy with the fossil record is discussed. Although the earliest fossils from the Upper Creatceous have been found in the Caribbean and in California, a major hiatus of on the order of 200 million years can easily account for the discrepancy between the earliest fossils and the biogeographical reconstruction, as well as for the large basal polytomy in the biogeographical analysis. All species are illustrated, including some distinct juvenile forms, and 30 photographs of live animals.

RIASSUNTO: Distribuzione e Biogeografia delle Haliotidae (Gastropoda: Vetigastropoda) recenti. Le Haliotidae comprendono 56 specie recenti descritte, distribuite su scala mondiale, nelle aree temperate e tropicali di entrambi gli emisferi. La distribuzione di tutte le 56 specie è qui illustrata da mappe digitalizzate, sulla base dell'esame oggettivo di esemplari e dell'analisi critica dei dati di letteratura. Sono quindi esaminati i tre modelli proposti per l'origine della famiglia: "Pacific Rim", Indo-Pacifico e Tetisiano. Il cladogramma di area, che tratta le distribuzioni delle singole specie come caratteri e le aree come OTUs, è in accordo generale con un albero filogenetico delle specie (derivato dall'analisi cladistica di dati molecolari ed allozimici) su cui vengano sovrimposte le distribuzioni geografiche. Il nodo basale del cladogramma di area è una politomia piuttosto ampia che riunisce provincie relativamente distanti come il Nord-Pacifico, l'Australia e l'Africa. Un quadro simile emerge dal cladogramma dei taxa. Sulla base dell'analisi di tali cladogrammi emerge un'origine generale Indo-Pacifica del gruppo, che sembrerebbe supportare il modello Indo-Pacifico di origine delle Haliotidae. Vi è un'apparente discrepanza tra questi dati e la loro susseguente interpretazione da una parte, e il record fossile dall'altra. I fossili più antichi noti provengono infatti dal Cretaceo Superiore dei Caraibi e della California. Ciononostante viene discusso come uno iato dell'ordine di 200 milioni di anni possa facilmente spiegare la discrepanza tra i fossili più antichi e la ricostruzione biogeografica più plausibile; si darebbe così anche ragione dell'ampia politomia basale nelle analisi cladistiche. Tutte le specie sono illustrate, con alcune distinte forme giovanili caratterizzate e 30 fotografie di animali viventi.

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INTRODUCTION

Abalone are a family of marine gastropods consisting of 56 currently described species of world-wide distribution in tropical and temperate waters of both hemispheres. During revision work on this family I have recently evaluated all Recent taxa, 200 at the species level and 17 at the genus level (Geiger, 1998a). Some other taxonomic matters have been dealt with elsewhere (Geiger 1998b, 1999; Geiger & Stewart, 1998, Stewart & Geiger, 1999). Knowledge of the distribution of most species is sketchy, particularly due to the absence of specimen based accounts. Most indications in the literature may be termed intuitive (e.g., Ubaldi, 1993, 1995) with limited exceptions (Geiger, 1996, 1999; Simone, 1998; Stewart & Geiger, 1999). In this second, larger treatment of the family Haliotidae, I concentrate on the distributional pattern of all Recent species, including a biogeographical analysis. To date, studies on the biogeography of the family are marked by their anecdotal nature. Three hypotheses (Fig. 1) for the origin have been proposed and have been discussed by Geiger & Groves (1999) in a review of fossil abalone.

Model 1 (Fig. 1A): Pacific Rim. An arc spanning from Japan to northeastern Australia has been identified by Talmadge (1963) as a likely cradle of the family. From this nuclear distribution abalone then dispersed in a star shaped pattern to the northwestern and then northeastern Pacific, to Australia and the Indian Ocean. The basis of this model was never made explicit.

Model 2 (Fig. 1B): Indo-Pacific. The highest present day diversity of the family is found in the Indo-Malayan area. Although it is well appreciated that the correlation of high present day diversity with origin of the group in question is highly problematic, it provides one possible center of radiation for the family, and was discussed by Lindberg (1992) and Briggs (1999).

Model 3 (Fig. 1C): Tethys. From published chromosomal count data Geiger & Groves (1999) considered an origin in the Tethys Sea. Since other Vetigastropoda and basal gastropods have a relatively low chromosome number (2n = 18-20: Patterson, 1967; Haszprunar, 1988) as compared to the values found in the Haliotidae (2n = 28-36: see Geiger & Groves, 1999, for sources) a progression from low to high values was considered. Bieler (1992) also concluded that the low chromosome number of patellogastropods is the

plesiomorphic condition within the archaeogastropod grade. It would suggest a radiation starting in the Tethys, today represented by the Mediterranean species *Haliotis tuberculata* Linnaeus, 1758, with 2n = 28, moving eastwards to the Indo-Pacific (2n = 32), and finally reaching the North Pacific (2n = 36).

Here the three proposed models are evaluated using specimen based distributional data for all species. The results from area cladograms are then compared to preliminary data on the phylogeny of the family.

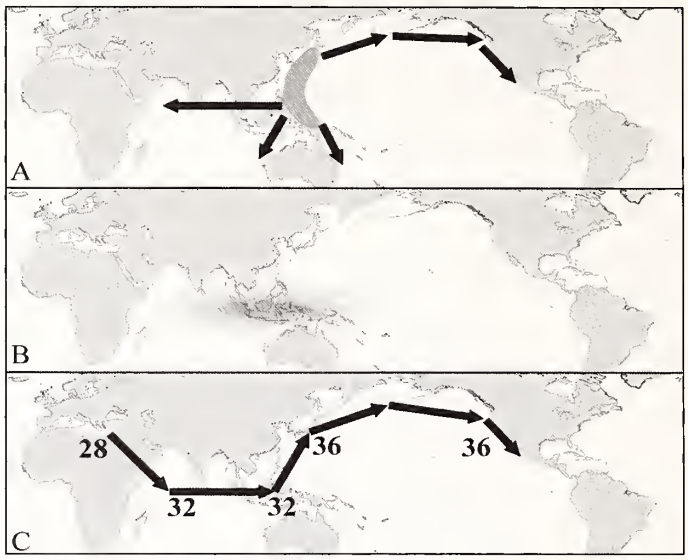

Fig. 1 - Illustration of the three biogeographical models proposed for the origin of the Haliotidae. A) Pacific Rim origin (Talmadge, 1963). B) Indo-Malayan origin (Lindberg, 1992). C) Tethys origin (Geiget & Groves, 1999). The numbers indicate the diploid number of chromosomes in the species fot which data is available.

Materials and Methods

Sources of Raw Data

Specimens in the natural history museums as listed below and some specialized private collections were personally inspected. After the identity of each specimen was verified, their localities were recorded. Additional records of specific localities and range information were obtained from the literature. Only those data were included that seemed to be reliable, i.e., publications illustrating specimens, species that are very hard to misidentify, and publications by authors, whom I know and trust with the identifications provided. Any arbitrary locality data have been excluded.

High resolution maps in a rectangular projection were obtained from the internet site provided by the Xerox Palo Alto Research Center (http://www.parc.xerox.com/). The maps were further processed in Adobe Photoshop 3.05 (see GEIGER, 1998c, for technical details). Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square. There may be fewer dots than listed localities because more than one locality may fall under the same symbol. Localities that seem very doubtful are identified with an adjacent question mark. Published range information is indicated with continuous lines for the core range, on which all the cited authors agree; broken lines indicate the peripheral range given by at least one author. Only specific indications such as "Point Conception" were taken into account as distributional limits, but no general terms such as "central California". For widespread taxa, information on their distribution in any sub-regions were combined.

Abbreviations of collections

Institutional collections: AMNH, American Museum of Natural History, New York; AMS, Australian Museum, Sydney; ANSP, Academy of Natural Sciences, Philadelphia; BMNH, British Museum of Natural History, London; CASIZ, California Academy of Science, Invertebrate Zoology, San Francisco; DMNH, Delaware Museum of Natural History, Wilmington; LACM, Los Angeles County Museum of Natural History; MHNG, Muséum d'Histoire Naturelle Genève, Switzerland; MNHN, Muséum National d'Histoire Naturelle, Paris, France; DMMF, Deutsches Museum für Meereskunde und Fischerei, Stralsund, Germany; NHB, Natural History Museum Basel, Switzerland; NM, Natal Museum, Pietermaritzburg, South Africa; NMBE, Natural History Museum Bern, Switzerland; NMW, National Museum of Wales, Cardiff, Great Britain; SBMNH, Santa Barbara Museum of Natural History; SMF: Senkenberg Museum, Frankfurt, a. M., Germany; UCMP, University of California: Museum of Paleontology, Berkeley; UR, Universitiy of Rostock, Germany; USNM, United States National Museum of Natural History, Washington, D. C.

Private collections: DLG, Daniel L. Geiger collection, Los Angeles, California; EN: Eike Neuberg collection, Frankfurt, a. M., Germany; JK, Joan Koven collection, Astrolabe Inc., Silver Spring, Maryland; KAS, Katharine A. Stewart collection, Carmel Valley, California; RP, Roger Pickery collection, Wilrijk, Belgium; SBS, Solly (Benjamin) Singer collection, Rehovot, Israel.

Biogeographical regions

The biogeographical regions were identified according to ECKMAN (1953) and BRIGGS (1995). The following areas were used, where both the distinctness of the area as well as the number of species present in the area was considered. The west American coast, for instance, was subdivided into several areas as they are well defined and several abalone species occur therein, however, the eastern coast of South America is represented as a single area containing two species.

1 - Northeast Atlantic: Eastern Atlantic from Normandy, France, to western Morocco (30° N).
2 - Mediterranean: Mediterranean Sea.
3 - West African: 30° N including Canary Islands to Cape Town, Republic of South Africa.
4 - South African: Cape Town, Republic of South Africa, to Kei River Mouth.
5 - Western Indian Ocean: Kei River Mouth, Republic of South Africa, to Karachi (67° E) without Red Sea, including Madagascar, Mascarenes, Seychelles, and Rodriguez Islands.
6 - Red Sea: North of Djibouti.
7 - Central Indian Ocean: Islands between Western Indian Ocean, Indo-Malayan province, and Australia: mainly Maldives, Sri Lanka, Chagos Archipelago.
8 - Indo-Malayan: Andamans, Malaysia, and Indonesia (to Irian Jaya) to south of Okinawa, including, Taiwan and Philippines.
9 - Central Pacific: East of Indo-Malayan Province and Australia to Henderson Island.
10 - Sub-tropical Japan: Okinawa to 36° N.
11 - Eastern North Pacific: From 36° N of Japan to western Aleutians.
12 - Aleutian: From western Aleutians to Portland, Oregon.
13 - Oregonian: From Portland, Oregon, to Point Conception.
14 - Californian: From Point Conception to tip of Baja California, to the exclusion of the Gulf of California.
15 - East Pacific: From the tip of Baja California to Peru, including

Gulf of California, Cocos Isl., and Galapagos Isl.
16 - Caribbean: From the tip of Florida peninsula to Salvador, Brazil.
17 - Argentinian: From Salvador, Brazil, to Golfo de San Jorge, Argentina.
18 - Solanderian: Torres Straits to Port Jackson, Australia.
19 - Peronian: Port Jackson to Melbourne, including Tasmania.
20 - South Australian: Melbourne to Hopetoun.
21 - West Australian: Hopetoun to Shark Bay.
22 - Northwest Australian: Shark Bay to Torres Strait.
23 - New Zealand: North and South Island; Kermadec, Chatham, Bounty, Antipodes, Campbell, Auckland, and Snares Islands.

Biogeographical analysis

Unrooted area cladograms were constructed using PAUP 3.1 (SWOFFORD, 1993) from the binary area data-matrix (Table 1). All taxa-as-characters were equally weighted, and uniformative characters were excluded. Heuristic searches with random taxon addition, 1,000 replications, tree-bisection-reconnection (TBR), and searches on non-minimal trees with STEEPEST DESCENT and MULPARS were performed.

The maximum length of the non-minimal length trees was limited by the maximum number of storable trees (approximately 32,700). This limit is a PAUP implementation problem and not due to insufficient RAM. Skewness or g1 values were obtained from five replications of 100,000 random trees with interval width of one and random starting tree.

Two taxonomic uncertainties were treated as follows. Specimens of the southern range of *H. diversicolor* Reeve, 1846 (Figs. 40-42), and those of the northern range of *H. squamata* Reeve, 1846 (Figs. 63, 66), bear some striking resemblance. The question of synonymy or separate species is currently unresolved. Separate analyses with the two taxa coded separately and with a single wide ranging species were performed. The status of *H. brazieri* Angas, 1869 (Figs. 45, 48), and *H. hargravesi* Cox, 1869 (Figs. 46, 49), is questionable in the light of their potential hybrids and specimens, in which the identity may change during ontogeny (GEIGER, 1998a).

The two taxa have identical distributions; hence, the question of character weighing is of concern. In one analysis the two taxa were both included; in a second analysis one was excluded.

Cladistic analysis of taxa

Taxon cladograms were constructed from recoded data published by BROWN (1993) and LEE & VACQUIER (1995). Midpoint rooting was employed (cf. WILLIAMS, 1992), because outgroup rooting was impossible with the data at hand. Allozyme frequencies were recoded with frequencies > 0.05 coded 1 and those < 0.05 coded 0. Multiple populations of any species were averaged (Table 2).

The cDNA sequences of the lysin gene of LEE & VACQUIER (1995) were recoded using data contraction and stretch coding as detailed in GEIGER, 1999: Table 3. These two coding schemes use a higher level of generality and introduce additional character states for regions of questionable alignment. The published alignment was adjusted manually.

Parsimony analysis was carried out in PAUP using heuristic search options with random taxon addition. Gaps were treated as fifth character state (GAPMODE =NEWSTATE), uninformative character were excluded, and branch swapping (TBR) on non-minimal length trees was performed with 1,000 replications. All characters and all character state transitions were equally weighted. MULPARS, STEEPEST DESCENT and RESPECT CASE were in effect. The allozyme data were not run with the traditional 0/1 character states as shown in Table 2, but with A/G, because otherwise the PAUP implementation limit of 31 character states was exceeded. This recoding has no effect on the phylogenetic reconstructions. Missing data lines for selected taxa not used in either of the studies are not shown in Tables 2 and 3.

Abbreviations: MPRs: maximum parsimonious resolutions; CI: consistency index; RI: retention index; RC: rescaled consistency index.

Distribution

The data of over 4,000 lots representing approximately 3,000 localities for the distribution of all the 56 species in the family Haliotidae grouped by larger geographic region is given at the end of the paper. On the order of 10,000 lots were inspected for the study. A number of reasons can be cited for exclusion of a particular lot: no or unprecise locality data; impossible locality data (e.g., the Australian endemic *H. elegans* Philippi, 1844, with label from the Mediterranean); redundant lot for any given combination of species and locality. The number of data points for each species range from 1 (*H. crebrisculpta* Sowerby, 1914: only a single specimen known. See STEWART & GEIGER, 1999) to 317 (*H. varia* Linnaeus, 1758). Seven species afford more than 100 individual localities (*H. asinina* Linnaeus, 1758, *H. cracherodii* Leach, 1814, *H. kamtschatkana* Jonas, 1845, *H. ovina* Gmelin, 1791, *H. rubra* Leach, 1814, *H. tuberculata*, *H. varia*) and for 12 species less than 10 localities are available. Some species are known from a reasonable number of specimens, but mostly from only a few localities. Striking examples are *H. elegans* and *H. semiplicata* Menke, 1843, for which most specimens come from Freemantle and Rottnest Island. A mean of 55 and a median of 28 localities per species are given here. The data are arranged in the following format:

1) Specimen data by country/larger area in a general east-west and/or north-south organization: COUNTRY/LARGER AREA: Specific locality (lot number, number of specimens). The second lot from the same locality is separated by a semicolon. No more than two lots are listed for any given locality. The term 'complete' indicates preserved animals. Parentheses indicate spelling variations and alternative names of the localities, documented in the literature or by other, objective means. Brackets indicate spelling variations and potential misspellings (erroneous copy in the past, problems with handwritten labels) stemming from my personal judgment.

2) Specimen data from the literature by author: locality (Author, Year). Here only localities not documented under 1) are listed. Any of these additional localities is listed once, despite potential, multiple mention in other publications.

3) Range data from the literature. Range indications with at least one specific deliminators were included whenever possible. Ranges stemming from apparent misidentification and other erroneous indications have been omitted.

The following abbreviations are used: ex: separated from

		00000000011111111112222222223333333333444444444455555555
		12345678901234567890123456789012345678901234567890123456
1	Northeast Atlantic	00000000000000000000000000000000000000000000000000010000
2	Mediterranean	00000000000000000000000000000000000000000000000000110000
3	West African	00000000000000000000000000001000000000000000000000010000
4	South African	00000000000000000000000000010100001000000001100000000
5	Western Indian Ocean	00001000000000000000000001011000011000001000110100 1000
6	Red Sea	00000000000000000000000000000000010000000000000001000
7	Central Indian Ocean	00001000000000000000000000001010000000000000000000100
8	Indo Malayan	10001000000001101000100100000010100000000000000010000100
9	Central Pacific	10001000100011100100000100000010101000010000000000000100
10	Sub-tropical Japan	10001000000101001001100100100010100000000000000000000100
11	Eastern North Pacific	00000000001010010010000001000000000000000000000000000000
12	Aleutian	00000000000000000000001000000000000000000000000000000000
13	Oregonian	00000011000000000010000010000000000000000100010000000001
14	Californian	00000011000000000010000010000000000000000100010000000001
15	Tropical East Pacific	00000000001000000000000000000000000001000000000000000000
16	Caribbean	01000000000000000000000000000001000000000000000000000000
17	Argentinian	01000000000000000000000000000000000000000000000000000000
18	Solanderian	10011100000010100000010000000010000000011000000010000100
19	Peronian	10011100010000000000100010000000000001010010000010000000
20	South Australian	00000000010000000000000001000000000000101001100000000000
21	West Australian	00001000000000010000000001000010000001010011000100000100
22	Northwest Australian	10001000000000010000000000000010100000000000000010000100
23	New Zealand	00100000000000000000010000000000000000000000000000000010

Table 1: Data matrix of biogeographical analysis. Areas-as-taxa as defined in text. Taxa-as-characters; subspecies are included in nominal species. 1*: asinina.* 2: *aurantium.*3: *australis.* 4: *brazieri.* 5: *clathrata.* 6: *coccoradiata.* 7: *corrugata.* 8: *cracherodii.* 9: *crebrisculpta.* 10: *cyclobates.* 11: *dalli.* 12: *discus.* 13: *dissona.* 14: *diversicolor.* 15: *dohrniana.* 16: *elegans.* 17: *exigua.* 18: *fatui.* 19: *fulgens.* 20: *gigantea.* 21: *glabra.* 22: *hargravesi.* 23: *iris.* 24: *jacnensis.* 25: *kamtschatkana.* 26: *laevigata.* 27: *madaka.* 28: *mariae.* 29: *marmorata.* 30: *midae.* 31: *ovina.* 32: *parva.* 33: *planata.* 34*: pourtalesii.* 35: *pulcherrima.* 36: *pustulata.* 37: *queketti.* 38: *roberti.* 39: *roei.* 40: *rubiginosa.* 41: *rubra.* 42: *rufescens.* 43: *rugosa.* 44*: scalaris.* 45: *semiplicata.* 46: *sorenseni.* 47: *spadicea.* 48: *speciosa.* 49: *squamata.* 50: *squamosa.* 51: *stomatiaeformis.* 52: *tuberculata. 53: unilateralis.* 54: *varia.* 55: *virginea.* 56: *walallensis.*

australis	00000000010000000001000000001000000000000000000000010000000000000100100010000000
coccoradiata	00000000100000000010000000010000000000010100000000000000000100000000010100000000
corrugata	00010000000000000000000100001000100001000000000000000000000000100000010000000010101
cracherodii	10000100001000000000000100010000000000000100000000000000000010000001000001000000
cyclobates	00001000000000000100000000010000000001001000010000000000000000100000001010100000
discus	10000000000000000000000100001000000000000100000100000000000010000001000001000010
fulgens	00010000000000000000000100001000000000000000010000000000000000100000011000010000000
iris	00101001000000000000000100001000000000000100000001000000000010000000100000001000
kamtschatkana	00000010001000000000000010000000100011000100000000000000000010000001000001000000
laevigata	00000000100000000001000000001010010000000000000000010000000001000000000101000000
midae	00001000000010000000000000001000000000000000101000000100000000000100010010000000
roei	00001000000000100000000000001000000000000000000000001000001001000000000101000000
rubra	00000000100001000010000000010000000000000000100010000010000100010001000010000000
rufescens	00010000000000000000010000100110000100010000000000000000100000100000010000010000
scalaris	00001000000000000010000001010100000000000000000010001000010010000000001010000000
virginea	00000000010000000010000000010000000000000000000000001000000000001000100000001000
australis	00000010001000000000000100010000001000100010100000000000000000000010
coccoradiata	00100000000100000000000000000000000001001000000000000001010000000000
corrugata	00010000010000000000000100001000000000000010000000000000000010000000
cracherodii	00010000010000000000000000000010000000000100101000000000000010000001
cyclobates	10000000000000000110001000000000000000000100100001000000000100000010
discus	00000000000000010000000000000000000011001000000000000000000010000100
fulgens	10000000000000010000010000000000000000001001001000000000000000010000000
iris	00000100001000000000000100100010000000000010010100000010000001000000000
kamtschatkana	01001000000001010000000000001000000000100100000000000000000010000000
laevigata	10001000000001010000100001000000000000000010000010010000000100100000
midae	00000010100000000000000000010000100000000000010000101000100000100000000
roei	00001000000000010000001000100000000000000000010000100000000001000000000
rubra	00000010000000010000000001001000000000000000100000000000000000100000000
rufescens	00001000000000010000000000001000000000010010000000000000000000010000000
scalaris	10001000000001000000011000101000000000000000000010010000000100100000
virginea	00000010000100000000000100100000010000000000000100001000000010010100000

Table 2: Recoded allozyme frequency data from Brown (1993). The enzymes are identified by their full name, their standard abbreviation in parentheses, and the electromorphs in lowercase letters.1-11: Aspartate aminotransferase (Aat-1) a-k. 12-24: Aspartate aminotransferase (Aat-2) a-m. 25-36: Glycerol-C-phosphate dehydrogenase (aGPD) a-l. 37-59: Glucosephosphate isomerase (Gpi) a-w. 60-66: Isocitrate dehydrogenase (Idh-1) a-g. 67-71: Isocitrate dehydrogenase (Idh-2) a-e. 72-78: Lactate dehydrogenase (Ldh) a-g. 79-89: Malate dehydrogenase (Mdh-1) a-k. 90-99: Malate dehydrogenase (Mdh-2) a-j. 100-118: Mannosephosphate isomerase (Mpi) a-s. 119-138: Phosphoglucomutase (Pgm) a-t. 139-151: Triosephosphate isomerase (Tpi) a-m

OPEN READING FRAME

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POSITION      *1                  *21                                                82*
australis     CKVVVVCVVGCGGGVGCG-KbFKFVGKVQVQKGFDVGVKVQVVGGFDKKVGGFVGKKGKKV-QGVQKKGVFFVQKKFCQGKF
coccinea      CKVVVVCVVGCCVGCGVG--e-------QVGKQFDVGVKVQVVGGFDKKVGGFVQKKGKGV-GGVQKKGVFFVQKKFCQGFF
corrugata     CKVVVVCVFGCCGGVVCG-KcFKFVGKKFVKKDFDVGVKVDVVGGFDKGVVKFVKVKGGKV-GGVQKKGVFFVQKKFCQGKF
cracherodii   CKVVVVCVFGCCGGVVCG-KbFQFVQKQFVKKGFDVGVKVDVVGGFDKGVVKFVKQKGKGV-QDQQKKVVFFVQKKFCQGKF
cyclobates    CKVVVVCVVGCCVGCGVG-KbFKFGKGKKVGKKFDGGVKVQVVVGFDKKVGGFVGKFGKQV-GGVKKKGVFFFQKKKCQGKF
discus        CKVVVVCVFGCCGGVGCG-KbFQFVKKQFVQKGFDVGVKDDVVGGFDKGVQKFVGGKGKGV-GGDQKKGVFFVQKKFCQGKF
diversicolor  CKVVVVCVVGCGVGCGGGVKaFGFVGKGKVQKGFDVGVKVQVVGGFDKKVGGFVGKKGGKV-GGV9KKGVFFVQKKFVQGKF
fulgens       CKVVVVFVFGCCGGVGCG-KbFGFVKFKFVQKGFDVGCKVQVVGGFDKQVGGFVKVKGKKV-GQQQKKGVFFVQKKFCQGKF
gigantea      CKVVVVCVFGCCGGVGCG-KbFKFVQKQFVDKGFDVGVKDDVVGGFDKGVVKFVKVKGKGV-GGVQKKGVFFVQKKFCQGKF
iris          CKVVVFCVVGC-VGVGGGF-aFGFGGGGFVGKGKVGGVKGQVVGGFDKKVGGFVKKKGQKV-GGVQKKGVFFVQKKFCQGKF
kamtschatkana CKVFVVCVFGCCGGVGCG-KaFGFVQGKFVQKGFDVGVKVDVVVKFDKKVVGFVKVQGGGV-GKVQKKGVFFVQKKFCQGKF
laevigata     CKVCVVCVVGCCVGVGCC-KbFKFVGKGKVGKGFDVGVKVQVVGGFDKKVVGFVQKKGKKV-GGVQKKGVFFVQKKFCQGKF
midae         CKVVVVFVFGCVVGCVDGFKdFFFVKKQFVGKGFDVGVKVQVVGGFDKKVGGFVKKKGGKVKGGVKKKGVFFVQKKFCQGKF
ovina         CKVVVVCVVGCCVGVGVG-KbFGFVGGGKVGKGKDVGVKVQVVGGFQKKVGQFVGKKGGKV-GGVQKKGVFFVQKKFCQGKF
pustulata     CKVVVVCVVGGCVGCGCG-KbFGFVGKKKVGKQFDVGVKVQVVGGFDKKVGGFVGKKGGKV-GGVQKKGVFFVQKKFCQGVF
roei          CKVVVVCVVGCCVGCGCG-KbFKFVGKKKVGKGFDVGVKVQVVGGFDKQVGGFVQKKGKKV-GGVQKKGVFFVQKKFCQGKF
rubra         CKVVVVCVVGCCVGVGCG-KbFKFVGKKKVGKQFDVGVKVQVCGGFDKKV?QFVGKKGKQV-GGVQKKGVFFVQKKFCQGKF
rufescens     CKVVVVCVFGCCGGVGCG-KaFKFVDGKFVQKGFDVGVKVQVVGGFDKGVVKFVKVKGKGV-GGVQKKGVFFVQKKFCQGKF
scalaris      CKVVVVCVVGCCVGVGCG-KbFVFGGKKKVGKQFDVGVKVQVVGGFDKKVVQFVKKKGKFV-GGVQKKGVFFVQKKFCQGKF
sorenseni     CKVVVVCVFGCCGGVGCG-KbFKFVGGKFVQKGFDVGVKVQVVGGFDKGVVKFVKGKGGGV-GKVQKKGVFFVQKKFCQGKF
tuberculata   CKVVVVCVVGCCVGCGV---e-------8VGKQFDVGVKVQVVGGFDKKVGGFVQKKGGGV-GGVQKKGVFFVQKKFCQGFF
varia         CKVVVVCVVGCGVGVGCG-KbFGFVGKKKVGCGKDVGVKVDVVGGFQKKVDVFVGKKGGKV-GGVQKKGVFFVQKKFCQGKF
walallensis   CKVVVVCVFGCCGGVGCG-KbFQFVGGKDVQKGFDVGVKDQVVGGFDKGVVKFVKGKGKGV-GKVQKKGVFFVQKKFCQGKF

POSITION      *83                                                          153*
australis     QGFCVFVQKQVGKVGKGGGDGDFGGVGGDVGKKVGVDVG-FGFVVKKQVVGKFKGFCGGVCGKKVQDVGVm
coccinea      QQFCVFVDDKVKKVGKGGQVQDFGGVGGDVGKKVGVQVGVFGVVVKFQVVGFKVGFCGKVVGVKVDDVGVl
corrugata     QQFCVFVVKKGDGVGKGGVVGDFGKVGGDVGKKVDCGFF-FQFVQGKQCVGKFVGFCDDVQKCKGGDVGVe
cracherodii   QQFCVFVVKKGQGVGKGGVVGDFKGVGGDVGKKVDCGFF-FQFVKQKVCVGKFVGFCKKVQQCKGDDVGVf
cyclobates    QGFCKFGDKDVKKVGKGGQGQDFGKVGGDVGKKVGVDVC-FGFCVKKQCVGKFKGFCGVVVKKKKDDVGVi
discus        QQFCVFVVKKVDGVGKGGVVGDFKKVGGDVGKKVDCDFF-FQFVKQKQCVGKFV7FCG6VQKCGGKDVGVd
diversicolor  GGFCVFVQKKVGGVGKGGGGGDFQQVGGDVGKKVGCDVG-FGFVVKKQVVGKFKGFCGDVCGKGGGDVDVj
fulgens       QQFCVFVKKKVKGVGKGGGVGDFGKVGGDVGKKVDCVFF-FQFVGGKKCVGGFGGFCGKVQGVKGGDVGVd
gigantea      QQFCVFVVKKVDGVGKGGVVGDFKKVGGDVGKKVDCDFF-FQFVKQKQCVGKFCGFCDDVQKCGGKDVGVc
iris          KGFCKFVKQQCKVVGKGDGGGDFQKVGGGVGKKVGVDVG-FGFVVKKQVVGFKVGFCGKVCGKKGGDVGGj
kamtschatkana GQFCVFVQKKGDGVGKGGVVGDFKKVGGDVGKKVDCVFF-FQFVGGKQCVGKFCGFCDQVQKCKGGDVGVa
laevigata     QGFCVFVGKQVGKVGKGGGVQDFGKVGGDVGKKVGVDVG-FGFVVKKQVVGKCKQFCKDVVGKGVQDVGVg
midae         QGFCVFVVKKVKGVGKGGGVGDFGGVGGDVGKKVGVDVG-FGFVVKKQVVGGFKGFCGKVCGKKGGDVGVg
ovina         GGFCVFVKKQVGKVGKGGQGQDFGKVGGDVGKKVGCDVQ-FGFVVKKQVVGKFKQFCGQVCGKKVDDVGVi
pustulata     QQFFKFVGKKVGKVGKGGQVQDFQGVGGDVGKKVGVDVG-FGFVVKKQVVGGFKQFCGQVVGKKVDDVGVg
roei          QGFCVFVVKQVDKVGKGGQVGDFGFVGGDVGKKVGVDVG-FGFVVKKQVVGQFKQFCGQVCGKKVDDVGVg
rubra         QCFCQFVVKDVDKVGKGGQVQDFGKVGGDVGKKVGVDVG-FGFVVKKQVVGKFKQFCGQVVGKKVDQVGVg
rufescens     GQFCVFVQKKVDGVGKGGVVGDFGKVGGDVGKKVDCGFF-FDFVKDKQCVGKFVGFCDDVQKCKGGDVGVa
scalaris      QGFCVFVVKQVGKVGKGGGVGDFGFVGGDVGKKVGVDVG-FGFVVKKQVVGDCKQFCKDVQGKKVDDVGVh
sorenseni     GQFCVFVQKKGDGVGKGGVVGDFGKVGGDVGKKVDCDFF-FQFVKGKQCVGKFVGFCDDVQKCKGGDVGVa
tuberculata   QQFCVFVDDKVKKVGKGGQVQDFGGVGGDVGKKVGVQVGVFGVCVKFKVVGKFKGFCGKVVGVKVDDVGVk
varia         GQFCVFVKKKVQGVGKGGGGGDFKQVGGDVGKKVGVDVG-FGFVVKKQVVGQFKQFCGDVCGKKVGDVGVj
walallensis   GQFCVFVQKKVDGVGKGGVVGDFGKVGGDVGKKVDCDFF-FQFVKGKQCVGKFVGFCDDVQKCKGGDVGVb
```

Table 3 - part one

Table 3. Recoded sequence of the lysin data of Lee & Vacquier (1995). Special coding strategies were employed for the listed positions, where the position refers to the current coding. Position numbers in plain type face use 'data contraction', those in bold type face employ 'stetch coding'. "a=TT" indicates a portion void of indels. "a=contains T" indicates portions with indels; gap position is not indicated as it would imply an understood homology relation to other positions. Open Reading Frame. 21: a=contains G; b=contains K; c=contains KK; d=KKKGK e=-----. 153: a=contains KFCGK; b=contains KFKGK; c=contains KQGGK; d=contains KQKGK; e=contains GQKGK; f=GQKQGGK; g=contains K; h=contains KG; i=contains Q; j=contains GKG; k=contains DFFGK; l=contains DFF; m=contains GQ. 3' Untranslated Region. 5: a=TT; b=contains T; c=--. 6: a=---; b=contains G; c=contains T; d=GGC. 20: a=contains TG; b=contains CG; c=contains GG; d=TATT; e=contains TT; f=----. 45-46: aa=contains A. 75: a=contains T; b=contains TCGTC; c=contains TAGTC; d=contains TCTTT; e=TCTTTCTT; f=contains CTTT; g=contains CCTT; h=contains TCCT; i=contains TCACT. 101-104: aaaa=contains CT. 111-114: aaaa=contains AC. 132: a=TGT; b=TTT; c=contains TT; d=GTT; e=contains TC; f=TTG. 9 = (EQ); 8 = (HQ); 7 = (GR); 6 = (AE).

3' UNTRANSLATED REGION

```
POSITION        *1 5**6            *20                      **45-46                          *75  82*
australis       TAAAabCACATGGATACAAaCGCCA-------------TCCCTATCTGACGTAAAAAGACGGAGA-TGGGG--dCATCAAG
coccinea        TAAAcaCACATGGAACCAAaGGCAA-------------CCGTGACATGATGTAAAAAGACGGA----------hCATCAAG
corrugata       ----ca----TGAAACCAAbAAGAAGAAAGCTGCATGCACCCTG-CATG---TCAACAGATACAGAAAACA---bCGTCAAA
cracherodii     ----ca----TGAAACCCAbAAGAAGACAGCTGCATGCACCGTGaaATG---TCAACAGATACAGAAAACA---bCATCAAA
cyclobates      TAG-ca-AC-TGGAACCAAaCACAA-------------CCGTGACATGACGTAAAGAGACGGA---TGGGGG-dCATCAAA
discus          ----ca----TGAAACCCAaAAGAAGACAGCTGCATGCACCGTG-CATG---TCAACAGATACAGAAAACA---a-------
diversicolor    TAA-acCACGTTGAAGTAAaTGCAA-------------CCGTGACGTGGCGTAAAAAGACAGAGAACGGGA--a------G
fulgens         ----ca----TGAAACCCAcAAGAAGACAGCGTCATGCACCGTG-CATG---TCAACGGATACAGAAAGCG---cCATCAAT
gigantea        ----ca----TGAAACCCAaAAGAAGACAGCTGCATGCACCGTG-CATG---TCAACAGATACAGAAAACA---aCATCAAG
iris            TAA-adCACGTGGAG----f-------------------CCGTG-CCCG---TTAACAGAAGGCA---------iCATCAAA
kamtschatkana   ----ca----TGAAACCCAbAAGAAGACAGCTGCATGCACCGTG-CATG---TCAACAGATACAGAAAACA---aCGTCAAA
laevigata       TAA-abCACGTGGAACCAAaCACAA-------------CCGTGACATGACGTAAAGAGACAGAGA-TGGGGG-dCATCAAA
midae           TAA-abCACGTGGAACCAAaTACAA-------------CCGTGACCCGACCTAAAGAGAGAGAGA-TGGGGGGdCATCAAG
ovina           TAA-abCACGAGGAAGTAAdCGCAC-------------CCGTGACTTGATGTA------CAGGGA-TGGAG--eCATCAAG
pustulata       TAA-caCATGTGCAACCAAeCGCAA-------------CCGTGACATGCCATAAAAA--CGGAGATTGGA---fCATCAAG
roei            TAA-abCACGTGGAACCAAaCACAA-------------CCGTGACATGACGTAAAGAGACAGCCA-TGGGGT-dCATCAAA
rubra           TAA-bbCACGTGGAACCAAaCACAA-------------CCGTGACATGACGTAAAGAGACAGAGA-TGGGGG-dCATCAAA
rufescens       ----ca----TGAAACCCAaAAGAAGACAGCTTCATGCACCGTG-CATG---TCAACAGATACAGAAAACA---aCGTCAAA
scalaris        TAA-abCACGTGGAACCAAaCACAA-------------CCGTGACATGACGTAAAGAGACAGAGA-TGGGGG-dCATCAAA
sorenseni       ----ca----TGAAACCCAaAAGAAGACAGCTGCATGCACCGTG-CATG---TCAACAGATACAGAAAACA---aCGTCAAA
tuberculata     TAA-caCACATGGAACCAAaGGCAA-------------CCGTGACATGATGTAAAAAGACGGA----------hCATCAAG
varia           TAGAbbCACGTGGAAGTAAeCACAA-------------CACGTACCTGACGGAAANNGACAGGAA-TGGGGA-fCATCAAG
walallensis     ----ca----TGAAACCCAbAAGAAGACAGCTGCATGCACCGTTGCATG---TCAACAGATACAGAAAACA---aCGTCAAA

POSITION                    101-104****     ****111-114          *132                          164*
australis       CACTGGATGGAGCC-ATGATGT----CATCCCAACGCGGCGT-GCCAGAb------TGCACCCAAAATATTCTATTTAACTC
cocinea         CACAGGATGGAGCC-ATGAC-------CACGCAATGCGGGATGGACAGAc------TACACCCAATAATTTGTATTTAACTG
corrugata       CACGAGG---AGCT-GTGACAGCATCCATCCCATCATGGGTTGGCTATTa----------------------ATTTTTAACAC
cracherodii     CACGGGG---AGCT-ATGACAC----CATCCCAACATGG----------a------TGCACG---------ATTTTTAACAC
cyclobates      CGCAGGATGGGGCC-ATGACGT----CATCCCAGCGCTGGGTGGCCAGAc------TTCACCAGATATATTCTATTTAACTC
discus          -------------------------CATCCTATCATGGGTTGGCTATTa------TGCACG---------ATTTTTAACAC
diversicolor    CATTGGATGGAGGC-ATGACGT------GCCCAGCACGGGTTGGCCAGAc---------GCCTAATATAACCTATTTGACCC
fulgens         TACGGAG---AGCT-ATGACAC----CATCGCATCATGGGTTGGCTATTa------TGCACGCAATGCACGATTTTTAACAC
gigantea        CACGGGG---AGCT-ATGACAC----CATCCTATCATGGGTTGGCTATTa------TGTACG---------ATTTTTAACAC
iris            CACT---TGGGAGCAATGACAC----TATCCCAACAGGGGTTGGCCCTTf------AGCACAAGACACACGATTTTTAACAC
kamtschatkana   CACGGGG---AGCT-ATGACAC----CATCCTAACATGGGTTGGCTATTa------TGCACG---------ATTTTTAACAC
laevigata       TGCTGGATGGGGCC-AGGACGT----CATCCCAGCGCGGGGGTGGCCAGAb------TTCACCAGATATATTCTATTTCTAAT
midae           CGTTGGATGGAGCCAATGACGT----CATCCCAGCGCGGGGTGGCCAGAc------TTCACCGGATAAATTCTATTTAACTC
ovina           CATTGGATGGAGCC-ATGACGT------GCCCAGCGCGGGGGTGGCCAGAb------TGCCCCCAGTATATTCTATTTAGCTC
pustulata       CGTTGGATGGAGTC-ATGACGT----CATCATAATGCGGAATGGCCAGAe------GGCACCCAATATATTGTTTTTAACTC
roei            TGCTGGATGGGGCC-ATGACGT----CATCCCAGCACGGGTT-GCCAGAb------TTCACCAGATATATTCTATTTAACTC
rubra           TGCTGGATGGGGCC-ATGCCGT----CATCCCAGCGCGGGGTGGCCAGAb------TTCACCAGATATATTCTATTTAACTC
rufescens       CACGGGG---AGCT-ATGACAC----CATCCTAACATGGGTTGGCTATTa------TGCACG---------ATTTTTAAAAC
scalaris        TGCTGGATGGGGCC-AGGACGT----CATCCCAGCGCGGGGTGGCCAGAb------TTCACCAGATATATTCTATTTCTAAT
sorenseni       CACGGGG---AGCT-ATGACAC----CATCCTAACATGGGTTGGCTATTa------TGCACG---------ATTTTTAACAC
tuberculata     CACAGGATGGAGCC-ATGAC-------CACGCAATGCGGGATGGACAGAc------TACACCCAATAATTTGTATTTAACTG
varia           CATTGGATGAAGCC-ATCaaaa------aaaaAGAGCGGGATGACTAGAdCAGAGTTGCCCCCAGTATATTCTGCATAACTC
walallensis     CACGGGG---AGCT-ATGACAC----CATCCTAACATGGGTTGGCCATTa------TGCACG---------ATTTTTAACAC


POSITION        *165                                                                      227*
australis       GTAAACATTGTACAATAGTGTACAATAGTGTACAATAGTGAATAAATACTTTTGACTAGAT--
coccinea        GTGAATATT---------TGTACTC----GTAAAATAGTGAATAAACATTTTCGACACAGTG-
corrugata       AGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
cracherodii     GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
cyclobates      GTAAATATT-------------------GTACAATAGTAAATAAATACTTTTGACTAGAT--
discus          GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
diversicolor    GTCCATATG-------------------GTACAATAGTAAATAAATAATTTTGACTAG----
fulgens         CGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
gigantea        GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
iris            GGGAACATT-------------------GTACATTCAGGAATAAATTGTTTTTA--------
kamtschatkana   GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
laevigata       GGAAACATT-------------------GTTCGATAGTAAATAAATACTTTTGACTA-----
midae           GTAAACATT-------------------GTACAATAGTAAATAAATATTTTTGACTAG----
ovina           ATACACGTT-------------------GTACAATAGTAAATAAATAATTTTGACTAGGT--
pustulata       GTAACCATT-------------------GTCCAATAGTCAATAAATAAGTTCTACTCTATG-
roei            GTAAACATT-------------------GTACGATAGTAAATAAATACTTTTGACTA-----
rubra           GTAAACATT-------------------GTACAATAGTAAATAAATACTTTTGACTAGAT--
rufescens       GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTACAAAA
scalaris        GGAAACATT-------------------GTACGATAGTAAATAAATACTTTTGACTAGAC--
sorenseni       GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
tuberculata     GTGAATATT---------TGTACTC----GTAAAATAGTGAATAAACATTTTCGACACAGTG-
varia           GCCAACATT-------------------GTNCAATAGTGAATAAATACTTTCGG--------
walallensis     GGAAAGATT-------------------GTACATTCCAGAATAAATAGATTT-ACTA-----
```

Table 3 - part two

that lot of non-conspecific specimens. GBR: Great Barrier Reef. Isl.: Island(s); N, E, S, W: North, East, South, West. WA: Western Australia. QLD.: Queensland. NT: Northern Territory. NSW: New South Wales. SA: South Australia. TAS: Tasmania. VIC: Victoria. PNG: Papua New Guinea. [?]: questionable identification. No #: no catalog number available.

Ten figures show dot maps for each species. The maps are grouped by geographic area: Mediterranean, west Africa, south Africa, and east Africa (Fig. 14); Indo-Pacific (Figs. 24, 43, 44); Australia and New Zealand (Fig. 67); northwestern Pacific (Fig. 86); northeastern Pacific (Figs. 87, 100, 107); and western Atlantic (Fig. 107).

Distributional patterns

Abalone are found along most rocky shores in tropical and temperate waters. Most are encountered in the shallow subtidal between sea level and 30 m depth. The substrate requirement explains the absence of representatives from northeastern America as well as from the western coast of the Indian subcontinent because sandy and muddy conditions prevail. There is a striking absence on western South America where not a single species of abalone is found despite rocky shorelines and suitable food sources in the form of kelp. This pattern is a small mystery particularly as abalone are so prominent on the west coast of North America down to the tip of Baja California, Mexico. Part of the answer may be found in the warm-water barrier between the two temperate areas on either side of the equator. However, the occurrence of the two abalone species on Galapagos Islands (*H. dalli* Henderson, 1915) and Cocos Island (*H. roberti* McLean, 1970) invalidate this argument to a certain extent, although ocean currents certainly facilitated dispersal to those particular islands.

There are no abalone species of global distribution. The largest areas are inhabited by some Indo-Pacific taxa. *Haliotis clathrata* Reeve, 1846 (East Africa to Samoa: STEWART & GEIGER, 1999), *H. asinina* and *H. planata* Sowerby, 1882 (Thailand to Fiji), and *H. ovina* (Maldives to Tonga), are the most widespread taxa. All other species have much more restricted ranges.

Four discrete regions of endemism can be identified. In South Africa five species are encountered, in New Zealand three, the western North American coast harbors six species, and Australia has nine endemics (excluding *H. rubiginosa* Reeve, 1846, and treating *H. hargravesi* as a form of *H. brazieri*). Within these areas the overlap with widespread species varies from none in western north America and New Zealand, to slight as shown by the infrequent finds in the South African province of *H. pustulata* Reeve, 1846, which has a core distribution in east Africa, to substantial in Australia. In the last, several species of tropical Indo-Pacific distribution can be found along the warmer coasts of Australia (i.e., *H. asinina*, *H. clathrata*, *H. ovina*, *H. rubiginosa*, *H. squamata*). However, those species, which seem to prefer more temperate waters (*H. brazieri*, *H. coccoradiata* Reeve, 1846, *H. cyclobates* Péron & Lesueur, 1816, *H. elegans*, *H. laevigata* Donovan, 1808, *H. roei* Gray, 1826, *H. rubra*, *H. scalaris* Leach, 1814, *H. semiplicata*), are endemic to the Australian continent. The Australian record (MACPHERSON, 1953) of the well-known *H. spadicea* Donovan, 1808, a common and recreationally fished species endemic to South Africa, is rejected. Some areas contain single species such as the eastern Indo-Pacific, i.e., Polynesia and surrounding islands (*H. pulcherrima* Gmelin, 1791), the eastern Pacific with Galapagos (*H. dalli*) and Cocos (*H. roberti*), and west Africa (*H. marmorata* Linnaeus, 1758).

Biogeography

Biogeographical areas

Biogeographical areas are often somewhat vaguely defined owing to the continuity of geographic space. The limits of biogeographic areas are then somewhat artificial. Three particular problems were encountered in the present study. 1) Oregonian province: The Oregonian province can be regarded as a transitional area between the Californian and the Aleutian province (cf. ECKMAN, 1953). The boundary area exists for virtually every area, hence, the allocation of the Oregonian area to the two others will only shift the problem of the boundary, but not solve it. Here the Oregonian province has been taken as a separate area. 2) Northwest Australia: this area is sometimes united with west Australia, but is retained here as a separate unit. 3) New Caledonia and Papua New Guinea: These two areas are tentatively included within the Central Pacific province.

Taxonomic issues

This work follows the general treatment of abalone taxa as outlined in GEIGER (1998a) and references therein. Although the treatment is comprehensive, some problematic issues remain. Two particular cases have ramifications in the present context: *H. diversicolor* - *H. squamata* (Figs. 40-42, 63, 66): characters 14 and 50; *H. brazieri* - *H. hargravesi* (Figs. 45, 46, 48, 49): characters 4 and 22 (Table 1). The former may be two distinct species in Japan and western Australia, both with sparse records in the Indo-Malayan region, or it may be a single widespread species. A further option to entertain is an antitropical distribution of two potential sister species with extinction in the tropical region (cf. BRIGGS, 1999). The latter case may also represent two distinct species with identical distribution or a single polymorphic species. To address these problems and their effects on the biogeographic analysis, the data matrix was manipulated as detailed in materials and methods.

GEIGER (1998a) tentatively resurrected a second Mediterranean species under the name *H. neglecta* Philippi, 1848, based on seven shells only (Figs. 147, 150). Recent efforts by B.Owen have produced additional material of this species including some animals, which clearly show the species to be distinct from the better-known, Mediterranean *H. tuberculata* (Figs. 4, 5, 7, 8, 12, 13, 172, 174). B. Owen (pers. comm.) pointed out, that the correct name for this second, Mediterranean species should be *H. stomatiaeformis* Reeve, 1846, itself a highly confused taxon. I use the correct name for this species here, but we will provide a more extensive treatment of

all the taxa involved elsewhere.

Area cladograms

Area cladograms show the relationship between geographic areas using a cladistic approach. The areas are treated as traditional taxa (areas-as-taxa) and the distributions of the species serve as the characters (taxa-as-characters: Table 1). Any species occurring in more than one area helps to illuminate the relationship between the areas, hence, is an informative taxon-as-character. The number of informative taxa-as-characters was 41 out of the 56. The strict consensus trees of the MPRs are shown in Fig. 2. Two different consensus topologies were recovered (Figs. 2A, B). The data-matrix as shown in Table 1 produced the first topology (Fig. 2A: 6 MPRs, length = 67, CI = 0.612, RI = 0.679, RC = 0.416). The same topology was found when *H. brazieri* and *H. hargravesi* where treated as being the same species, i.e., when taxon-as-character 4 was excluded (6 MPRs, length = 66, CI = 0.615, RI = 0.688, RC = 0.423). The topology of Fig. 2B resulted when *H. squamata* and *H. diversicolor* were treated as one widespread species (8 MPRs, length = 63, CI = 0.635, RI = 0.716, RC = 0.455), and also when *H. brazieri* and *H. hargravesi* were treated additionally as being the same species (8 MPRs, length = 61, CI = 0.639, RI = 0.725, RC = 0.464). Branch swapping on non-minimal length trees did not recover any additional MPRs as compared to simple heuristic searches. All searches with branch swapping on trees two steps longer than the most parsimonious trees resulted in memory overflow (more than 32,700 trees). All consensus trees are characterized by a fairly broad basal polytomy, with additional resolution in more specific areas.

Skewness or g1 was -0.77 (± SE = 0.0014, n = 5), which is highly significant according to the values provided by HILLIS & HUELSENBECK (1992: 25 taxa, 50 characters for p = 0.05 g1 = -0.10; for p = 0.01 g1 = -0.11). These contradictory results—highly significant g1 *versus* broad basal polytomy and over 32,700 MPRs with only two additional steps—support the suspicions voiced by KÄLLERSJÖ *et al.* (1992) that g1 does not measure information content of the data matrix.

The common feature of both consensus topologies are as follows. A European-west African group, a south Africa and western Indian Ocean group, a broad Indo-Pacific group, an eastern Pacific group, and a western Atlantic group are recognized in all analyses. A number of regions are united in a basal polytomy. The position of the New Zealand and the tropical eastern Pacific provinces can be explained due to all the respective species being endemic, and no other species occurring there (New Zealand: *H. australis* Gmelin, 1791, *H. iris* Gmelin, 1791, *H. virginea* Gmelin, 1791. Tropical eastern Pacific: *H. dalli, H. roberti*). These species constitute autapomorphies for the regions, hence it is impossible for these regions to show relationships with other provinces.

The same applies also to the western Atlantic provinces, i.e., the (Caribbean, Argentinian) group. The remaining areas in the basal polytomy are placed due to uncertain associations with other areas.

The differences between the two consensus topologies lies

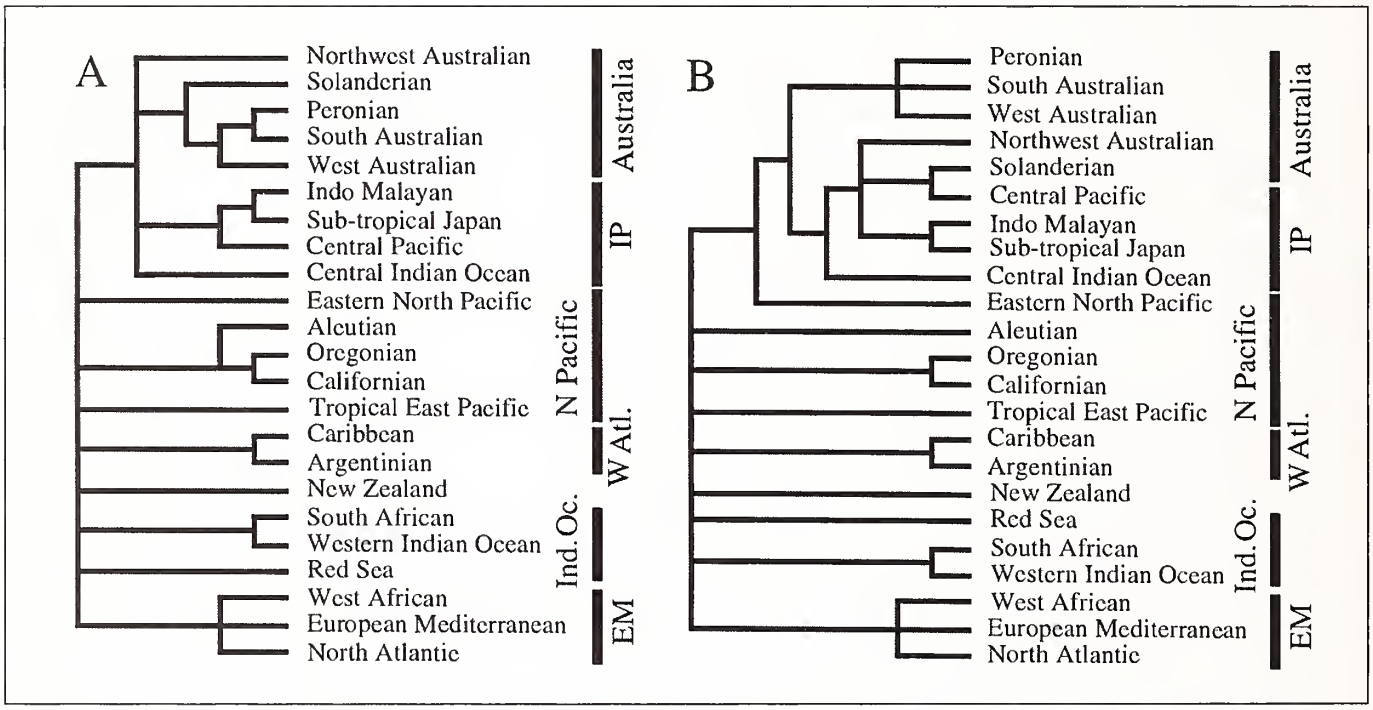


Fig. 2 - Area cladogram (Brooks parsimony) for the genus *Haliotis*. Strict consensus all MPRs. EA: East Africa. M: Mediterranean. IP: Indo-Pacific. NZ: New Zealand. SA: South Africa. W Atl.: western Atlantic. A) From data matrix as shown in Table 1, and when *H. brazieri* (taxon-as-character 4) is excluded. B) From data matrix combining *H. diversicolor* and *H. squamata* into one widespread taxon.

in details of the association of provinces within the Indo-Pacific group. Fig. 2A shows four of the five Australian provinces united, and an (Indo-Malayan, subtropical Japan, central Pacific) group separated from these Australian provinces. The central Indian Ocean and northwest Australia join basally. In Fig. 2B, however, only three of the five Australian provinces, i.e., the southern provinces, are united, whereas the warm-water Australian provinces are found more closely associated with the (Indo-Malayan, subtropical Japan, central Pacific) group. The eastern north Pacific is a basal off-shoot from the latter. Hence, the main difference is the affinity of the warm-water Australian provinces with either the remaining Australian provinces (Fig. 2A) or to the Indo-Malayan province and associated areas (Fig. 2B). The basal placement of the eastern north Pacific is difficult to explain as it lies between the large polytomy representing a broad Indo-Pacific region (see below), and a subset thereof.

If one traces back all the faunal provinces to the large polytomy, the latter represents a broad Indo-Pacific region from which all the more resolved groupings had been radiating out. This pattern is evident in both consensus trees shown in Figs. 2A and B. The biogeographical analysis then best supports the Indo-Pacific hypothesis for the origin of the family, as discussed by LINDBERG (1992), and by BRIGGS (1999) for other taxa. However, some contra-indications are found within the analysis. The Indo-Pacific origin would imply that the northeastern Pacific provinces should be derived from subtropical Japan, but these are rather found in a basal position. To see whether a single erratic position of some provinces may be responsible for the large basal polytomy, a 50% majority rule consensus tree was calculated. It was identical to the strict consensus tree showing that there is widespread disagreement among the individual MPRs regarding the position of the provinces joint in the basal polytomy. The basal position of the broad Indo-Pacific and the northeastern Pacific groups seems also compatible with TALMADGE'S (1963) Pacific Rim hypothesis. It would, however, imply an origin of the Indian Ocean and eastern Atlantic provinces from within the broad Indo-Pacific group. However, the Indian Ocean as well as the eastern Atlantic groups stem from the basal polytomy as well. Accordingly, the best supported hypothesis for the origin of the Haliotidae is within a broad Indo-Pacific region. From the present data, the precise location of the origin can not be pinpointed more precisely.

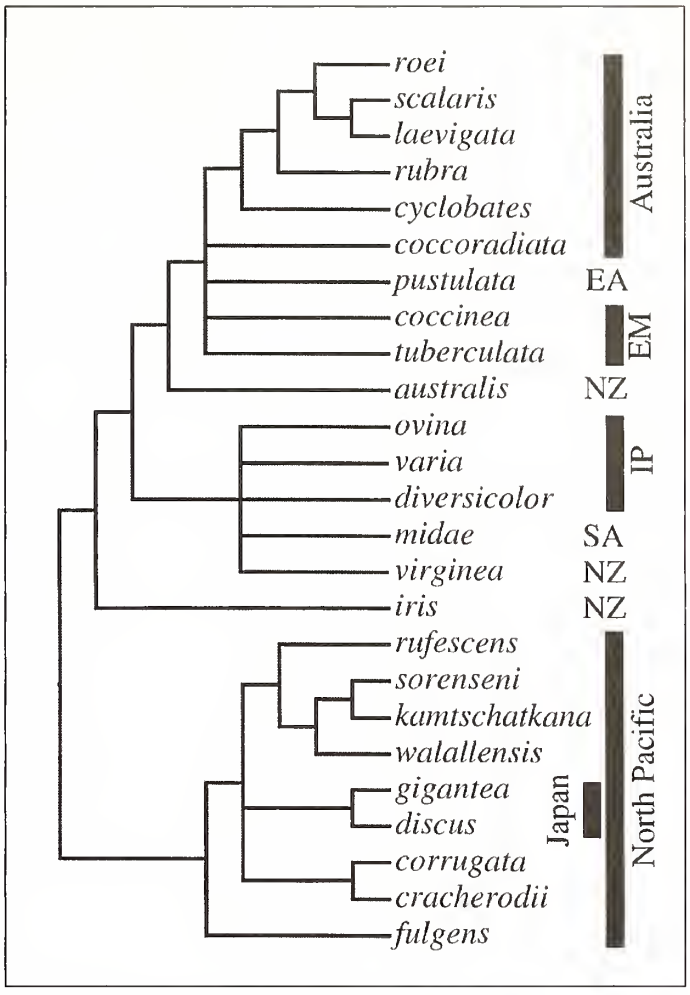


Fig. 3 - Midpoint rooted taxon cladogram of the genus *Haliotis*. Strict consensus tree of 98 MPRs. EA: east Africa. M: Mediterranean. IP: Indo-Pacific. NZ: New Zealand. SA: south Africa.

Cladistic analysis of taxa

In the total evidence cladistic analysis for 25 taxa and 531 characters, 285 were parsimony informative. 98 MPRs (length = 904, CI = 0.621, RI = 0.760, RC = 0.472, g_1 = -0.533 ± SE = 0.00277) were recovered in the initial search. Branch swapping on non-minimal trees of maximum length = 908 did not recover any more parsimonious topologies or any additional MPRs.

A comparison of the area cladogram (Fig. 2) to the taxon cladogram (Fig. 3) reveals a pattern in general agreement between the two analytical approaches. Most of the Australian (Fig. 3: Australia) and all the north Pacific species are united as larger monophyletic groups, with some additional groupings in the Indo-Pacific (Fig. 3: IP) and the Mediterranean (Fig. 3: EM) provinces. The north Pacific group uniting both the eastern and western regions, is very strongly shown in Fig. 3 (North Pacific) as well as in separate analysis of various sub-sets of the underlying data (not shown, see also BROWN, 1993; LEE & VACQUIER, 1995). The most unsettling problem relates to the position of the New Zealand species (*H. australis, H. iris, H. virginea* Fig. 3: NZ), which are all endemic to New Zealand. They are distributed over the tree, an outcome seen even more pronounced in analyses of sub-sets of the data (not shown). These three species seem to result from individual colonizations of the island as contrasted with a small radiation in this rather isolated region. The basal split of *H. australis* from the remaining Australian species makes intuitive sense. The position of the other two taxa is more challenging to interpret. *Haliotis iris* is wedged in between the Californian *H. fulgens* Philippi, 1845, and the root of the cladogram. The root would then be trace to some general south Indo-Pacific region. The New Zealand *H. virginea* is found in a polytomy with Indo-Pacific species and the south African *H. midae* Linnaeus, 1758.

A general SW Indo-Pacific origin is implied from that polytomy. The root can be traced back to a general Indo-Pacific region. This rather suprising pattern of multiple colonizations of New Zealand agrees with finds from other groups of organisms such as beeches (*Notofagus*), African violets (Gesneriaceae), a caddis fly genus (*Hydrobiosella*), and platycercine parrots discussed by HUMPHRIES & PARENTI (1986).

The type species of the genus *Haliotis*, *H. asinina* (Figs. 35, 36, 165, 166), was not included in either studies (BROWN, 1993, LEE & VACQUIER, 1995). Accordingly, any pertinent taxonomic decisions can not be made at this time. The discussion of supraspecific taxa in LEE & VACQUIER (1995) also suffers from this condition.

Some of the disagreement between the area cladogram and the taxon cladogram may be explained by the taxon sampling of the taxon cladogram. Note for instance that the European species *H. t. tuberculata* and *H. tuberculata coccinea* Reeve, 1846, are removed from the South African *H. midae*. It may be due to the missing W African *H. marmorata*, and only one of the five South African species being included in the analysis. Hence, some minor disagreement between the biogeographical and the taxon analysis should not distract from the overall pattern pointing to a broad Indo-Pacific origin postulated by both analytical approaches.

Illustrations of species

All 56 described species in the family Haliotidae are figured here, along with one species in the process of being described (GEIGER, 1999; OWEN *et al.*, in review). Those species that have hardly been illustrated are shown in color, the better known species in black and white. Indications to published illustrations can be found in GEIGER (1998a). Some species have distinct juvenile forms, which deserve particular attention.

Haliotis iris (Figs. 74-79): the adult of this species are very well-known from New Zealand and difficult to misidentify. However, the subadults lack the characteristic striated muscle scar and the only slightly widened columella may easily be missed. Juveniles lack not only the muscle scar, but also the wide columella, and are often confused with adult *H. virginea* (Figs. 69, 70, 72, 73). The latter, however, has a lighter shell, more subtle cording, and often an undulating dorsal surface.

Haliotis midae (Figs. 142-145, 148): The adults of this commercial species endemic to South Africa has two distinct color morphs. In the eastern part the dark red form is found, in the western part the shells of adults are white. The strong lamellae and the numerous, elevated, but small holes are common to both. The juveniles, on the other hand, have an entirly smooth shell, which is always dark earthy-red in color, the larger tremata are not elevated at all, and the overall shape is more elongated than the almost round adults. Often the nacre in the spire region has an orange tinge, which has lead to misidentifications of juvenile *H. midae* as *H. spadicea* (= *H. sanguinea*. Figs. 151-153). Juveniles of *H. spadicea*, however, have an arched and inflated shell contrasting to the flat shell of juvenile *H. midae*. *Haliotis spadicea* also shows a few distinct spiral cords, whereas juvenile *H. midae* show numerous, very fine spiral threads.

Haliotis asinina (Figs. 35, 36, 165, 166): Adults are characterized by the very elongated, smooth, and relatively thin shell of green or brown color with white triangular markings. Juveniles up to a size of 3.5 - 4 cm show distinct spiral ridges, which display a crenulated color pattern of alternating white, red, green, and sometimes even blue dots (Fig. 166). Juveniles can not be confused with other abalone species, but often remain unidentified due to the discrete differences to adult shells.

Color variability is extensive in the Haliotidae. I have selected a few particularly well-known cases, but those species that are only shown with a single specimen often show a similar range in their coloration (e.g., *H. varia*). *Haliotis jacnensis* (Figs. 124-129) exhibits variation in both sculpture as well as coloration. The major sculptural element are the hollow scales, which start at the suture and extend to a variable degree towards the row of holes (Fig. 126 vs. Fig. 129), though a more or less distinct area devoid of scales is located proximal to the row of holes. For *H. semiplicata* Menke, 1843, three shells are illustrated, which differ both in overall tonality as well as in the color pattern. Differences in color pattern are abundant and are presented for *H. glabra* (Figs. 26, 27, 30), *H. ovina* (Figs. 32, 33), *H. diversicolor* (Figs. 40, 42), and *H. virginea* (Figs. 69, 70, 73). *Haliotis parva* (Figs. 154-156) shows the usual variation in the mottled specimens with red and green tones, but a number of specimens have a uniform bright orange shell. Such a coloration is now also known from two other South African species, *H. queketti* and *H. speciosa* (B. Owen, pers. comm.). Other sculptural variability is encountered in the European *H. tuberculata*. Mediterranean populations contain both entirely smooth (Fig. 4) and highly lamellous (Fig. 5) specimens. The elevation of the spire can also differ markedly (Figs. 12, 13). Such differences do not warrant formal recognition at any taxonomic level.

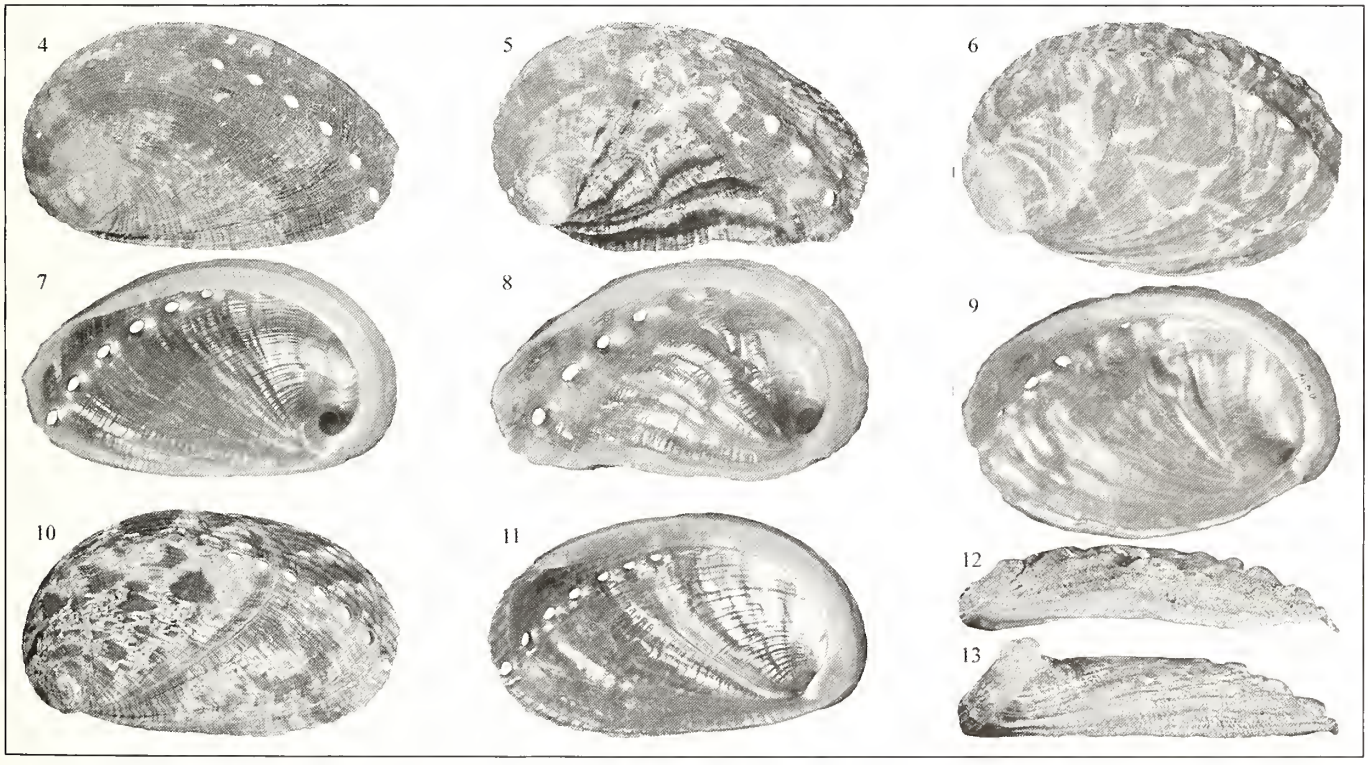
Figures 103 and 106 show an intriguing specimen of unknown identity. It is one of three rather similar specimens in the MNHN ranging in size between 52 and 68 mm. According to the lable they were collected in Shang Hai in 1854. The specimens show a unique combination of characters: strong cords with some scales, and irregularly placed and deep folds. These specimens certainly do not represent any of the known species in the area: *H. discus* Reeve, 1846, *H. diversicolor*, *H. gigantea* Gmelin, 1791, *H. madaka* Habe, 1977. The closest affinity is to *H. rubra*. However, the cording in *H. rubra* is usually much finer, specimens with folds are unknown to me, and *H. rubra* is a species endemic to southern Australia. The Shang Hai locality has to be treated with caution, because erroneous locality data abound particularly with 19th century specimens and publications. To mention but some of the most egregious cases, *H. unilateralis* Lamarck, 1822, has a type locality in Australia, but is restricted to East Africa; *H. squamosa* Gray, 1826, also has its type locality in Australia, but is endemic to south Madagascar; and *H. zealandica* Reeve, 1846, described from New Zealand is actually the Mediterranean *H.*

tuberculata. A pathological condition of the Shang Hai specimens can be ruled out, because the three specimens are very similar to one another and do not show any known signs of accidents or disease, such as laterally shifted row of holes, holes closed out of sequence, strong growth mark, abrupt change in sculpture, thickened shell, blister pearls, or downward growth of aperture. P. Bouchet (pers. comm.) has suggested the possiblility that these specimens may be representative of a now extinct species. Marine extinction is an overlooked topic (cf. TEGNER *et al.*, 1996; DAVIS *et al.*, 1996) and additional data is required to clarify this case.

A particular effort to locate photographs of living animals has born fruits as shown in Figs. 163-192. Many of the species are illustrated here for the very first time including, juvenile *H. asinina* (Fig. 166), *H. roberti* (Figs. 167, 168), *H. unilateralis* (Figs. 169, 171), *H.* sp. nov. Owen *et al.*, in review. (Fig. 170), *H. coccoradiata* (Fig. 186). *H. semiplicata* (Fig. 187), *H. hargravesi* (Fig. 189), *H. squamata* (Fig. 191), and *H. elegans* (Fig. 192).

Biogeography and the fossil record

The area cladogram as well as the taxon cladogram approach both place the origin of the abalone in a generalized Indo-Pacific region. How does this find compare to the fossil record? The earliest known abalone fossils stem from the uppermost Cretaceous (Maastrichian). *Haliotis lomaensis* Anderson, 1902, had been found at Point Loma, California, *Haliotis antillesensis* Sohl, 1992, on the other hand in Puerto Rico and Jamaica (see GEIGER & GROVES, 1999, for review). Both localities certainly do not represent the Indo-Pacific by any stretch of the imagination. A look at the putative sistergroups of the Haliotidae will shed some light on this apparent discrepancy. The Pleurotomariidae or the Trochidae have been proposed as sister groups of the Haliotidae. The Haliotidae have also been placed in a basal polytomy of the Vetigastropoda with an apomorphic Pleurotomariidae - Trochidae clade, as a sistergroup to the Fissurellidae, or in a polytomy with all Vetigastropoda except for its sistergroup the Pleurotomariidae (TILLIER *et al.*, 1994; PONDER & LINDBERG, 1997; HARASEWYCH *et al.*, 1997 for review). All these families have a long standing fossil record reaching back into the Triassic (KNIGHT *et al.*, 1960; TRACEY *et al.*, 1993; BANDEL, 1998), and the Trochidae may have originated as early as the Permian or Ordovician as discussed by HICKMAN & MCLEAN (1990), although TRACEY *et al.* (1993) questioned any Permian records. The exact date of the split between these lineages will remain uncertain for the foreseeable future. Even molecular clock studies (e.g., FELSENSTEIN, 1985; SPRINGER, 1995) will not be able to add any information due to the extremely variable speed of the molecular clock (see MINDELL & THACKER, 1996; HILLIS *et al.*, 1996, for reviews). Accordingly, the Haliotidae had on the order of 200 million years to alter their distribution pattern from their area of origin. Hence, the incompleteness of the fossil record accounts for the apparent discrepancy between the analytical approach and the fossil evidence. On top of this major hiatus, a negative taphonomic feedback due to the habitat of abalone and their



Figs. 4-9. *Haliotis tuberculata* Linnaeus, 1758. Figs. 4, 7. DLG AAB 14af. Cala St. Maria, Montecristo, Italy. Between rocks and on sand, 3 - 18 m, 28.VI. - 20.VII. 1988. 40 mm. Very flat form. Figs. 5, 8. DLG AAB 14bl. Preveza, Greece. Leg. Vanglis Tzimas, 28. IV. 1995. 41 mm. Highly lamellose form. Figs. 6, 9. DLG 14 am. Erquy, Brittany, France. 93 mm. Atlantic form of *H. t. tuberculata*. Figs. 10-11. *Haliotis tuberculata coccinea* Reeve, 1846. DLG AAB 14 bg. Azores, Portugal. 60 mm. Note more elongated shape and the distinct spiral grooves. Figs. 12-13. DLG AAB 14b. Naxos, Sicily, Italy. In rock canyons and open rock fields, 3 - 6 m, IX 1985. Appertural view showing variation in spire elevation.

shell mineralogy further questions whether even the two finds from the Maastrichian accurately represent the distribution of abalone at that time; see GEIGER & GROVES (1999) for a more in-depth discussion.

DISTRIBUTIONAL DATA AND MAPS

Mediterranean and West African Species (Figs. 4-14, 146, 147, 149, 150, 170, 172, 174)

Haliotis marmorata Linnaeus, 1758 (Figs. 14, 146, 149)

AZORES: Guadalupe, Praia das Conchas (MNHN no #, 2). Guadalupe, Praia Mouro Peixe (MNHN no #, 2). SPAIN: Canary Isl., Cape Palmas (ANSP 50527, 1). MAURITANIA: Port Etienne (MNHN no #, 1; MNHN no #, 1). SENEGAL: Cap Vert (LACM 76-43, 3; MNHN no #, 13). Presque Ile de Cap Vert, Almadies (MNHN no #, 8). Cap Vert, N'Gor (AMNH 220228, 13; MNHN NO #, 2). Dakar (MNHN no #, 1; MNHN no #, 2). Dakar, M'Gor (DLG AAB 14g, 2). Dakar, Anse Bernard (MHNG 21132, 5). Dakar, Almadines (MNHN no #, 30; SBMNH WW2472&2444, 6). Point Almadies (SBMNH 6152, 2). Off Dakar, Île de Gorée (LACM 76-45, 3; BMNH no #, 3). Petite Coast, Joal River (LACM 76-47, 1). GAMBIA: Bathurst (BMNH 2341, 1). SIERRA LEONE: Freetown (DMNH 012829, 1). GHANA: (BMNH no #, 2). Accra (AMNH 103367, 1; NHB 1705e, 1). Off Busua, small isl. (AMNH 220229, 2). LIBERIA: Monrovia (ANSP 193228, 2; BMNH no #, 3). GABON: (AMNH 19706, 5; MNHN no #, 1). Libreville, Cap Esterias (MNHN no #, 1). SÃO TOMÉ: (MNHN no #, 6, MNHN no #, 2). São Tomé and Prince (AMNH 238663, 5). Praia Emilia (MNHN no #, 2). Spanish Guinea, Santa Isabel (USNM 653538, 3). Île de Prince (MNHN no #, 3). Île du Prince, Ilot Caroço (MNHN no #, 2). EQUATORIAL GUINEA: Fernando Poo (= Bioko), San Carlos Bay (AMNH 150778, 1). IVORY COAST: (MNHN no #, 1).

LITERATURE, LOCALITIES: Ghana, Takoradi Harbour (UBALDI, 1987).

LITERATURE, RANGE: Gabon (BERNARD, 1984). West Africa (ABBOTT & DANCE, 1983: as *rosacea*).

Haliotis stomatiaeformis Reeve, 1846 (Figs. 14, 147, 150)

ITALY: Sicily: (MNHN no #, 1). Sicily, Palermo (MNHN no #, 1). Giardini (HUJ 6313b, 3). Lampedusa (HUJ 6313a, 1). MALTA: (DLG AAB 51a, 1; LACM A.2777, 2; DMNH 097371, 1; BMNH 1829, 2).

Haliotis t. tuberculata Linnaeus, 1758 (Figs. 4-9, 12-14, 172, 174)

IRELAND: Rosslare Strand (BMNH 1931.1.12.1, 1). GREAT BRITAIN: Channel Isl., Sark (DMNH 011010, 3; USNM 179300, 4). Guernsey Isl. (LACM A.1463, 4; LACM A.52a, 2). Guernsey Isl., Lihou (BMNH 1838, 4). Jersey (LACM 45894, 1; LACM 2777, 2). Channel Isl., Herm (AMNH 259795, 1; NMBE Schuttleworth, 3). The Minqueries, off Channel Isles (ANSP 303052, 2). Herm (USNM 179298, 2; USNM 179291, 8). W-FRANCE (ATLANTIC): Dunkerque (MNHN no #, 1). Le Havre (LACM 28817, 3). Normandie, Ille Chaussey (MNHN no #, 1). Cherbourg (ANSP 50169, 2; MNHN no #, 2). Mont Saint Michel (NMBE 1327.24, 3). St. Malo (MNHN no #, 1; MNHN no #, 1). Brittany, Erquy (DLG AAB 14ag, 1; DLG AAB 14am, 1). Baie de St. Brieuc (MNHN no #, 2). Binic, C. du Nord (MNHN no #, 5). Bréhat (MNHN no #, 1). Paimpol (MNHN no #, 1). Ile d'Er (MNHN no #, 9). Brittany, Ile de Batz (NHB 1705d, 2). Lannion (MNHN no #, 2). Roscoff (AMNH 91645, 1; MNHN no #, 2). Brittany, Brest (LACM 45899, 1; MNHN no #, 1). Baie de Brest, Finistère (MNHN no #, 2). Brittany, Finistère, Camaret (NMBE 1327.540, 1). Trébeurdon, Cap du N (MNHN no #, 17; AMNH 101811, 1). Ile de Yeu (MNHN no #, 1). Lorient (AMNH 239006, 3). Concarneau (MNHN no #, 1). Ile de Glénans (MNHN no #, 1). Hendaye (ANSP 50498, 2). St. Jean-de-Luz (NMBE 1327, 6; MNHN no #, 20). Guethary (MNHN no #, 30; MNHN no #, 7). Nantes (USNM 73160, 1). PORTUGAL: Algarve (NMBE 1327.985, 1). Algrave, Sagres (DMNH 059569, 7). SPAIN: Vigo, Bayona (SBMNH 36331, 2). Ruinas de Bolonia (USNM 739330, 1). Costa Brava, Beach of Aiguablava (NMBE 1327.611, 2; SBMNH 24997, 1). Barcelona (ANSP 211557, 1). Valencia (AMNH 111953, 1; USNM 781971, 3). Balearic Isl., Menorca, Illa del Aire (DLG AAB 14at, 17). Balearic Isl., Menorca, Fornells (DLG AAB 14au, 50). Balearic Isl., Menorca, S'Amandar (DLG AAB 14av, 24). Balearic Isl., Menorca, Illa de Porros and Cala Torta (DLG AAB 14aw, 59). Balearic Isl., Menorca, Illa d'en Colom (DLG AAB 14ax, 64). Balearic Isl., Menorca, Cala Patenta (DLG AAB 14az, 3). Balearic Isl., Mallorca, Illa Dragonera and Cabrera (DLG AAB 14ay, 11). Balearic Isl., Mallorca, Santa Ponsa (DLG AAB 14d, 1). Balearic Isl., Mallorca, Colonia de Saint Jordi (DMNH 108794, 1). Balearic Isl., Ibizza (AMNH Edison A9853, 1; USNM 424773, 3). Balearic Isl., Ibizza, Calla Bassa, Santaria (DLG AAB 14n, 6). Balearic Isl., NE of Formentera (DLG AAB 14bi, 13). Balearic Isl., Formentera, 10 km N of Es Pujols (DLG AAB 14ar, 15). Alicante, Javea (LACM 81-60, 3). Granada, La Herradura (MNHN no #, 3). Malaga (AMNH 111952, 1; USNM 781966, 2). Malaga, Benalmadena-Costa (MNHN no #, 4). Malaga, Estepona (MNHN no #, 1). Malaga, Calahonda (MNHN no #, 15; MHNG 21131, 5). Malaga Province, E Marbella, Torre de Calahonda (LACM 94-20, 4). Malaga, Torremolinos (MHNG 21165, 1). Cadiz, Tarifa (DMNH 073587, 4; DMNH 073583, 7). Cadiz, Tarifa, Torre de la Peña (MNHN no #, 3). Cadiz, Getares, Punta Carnero (MNHN no #, 1; MNHN no #, 2). Cadiz, Sotogrande, Torre Guadiaro (MNHN no #, 1). Gerona, Soin Felui de Guinels (DMNH 179563, 5). Gerona, Puerto de la Selva (SBMNH 6173, 1). Almeria (MNHN no #, 10). Cadaques (AMNH 259794, 3; MNHN no #, 15). Collohando (ANSP 246246, 1). GIBRALTAR: (DMNH 011033, 2; DMNH 129548, 1). Ceuta N, Benzu (MNHN no #, 1; MNHN no #, 3). Ceuta N, Pta del Saudino (MNHN no #, 1). Ceuta S, El Pineo (MNHN no #, 2). Ceuta S, Anse Almadraba (MNHN no #, 7). S-FRANCE (MEDITERRANEAN): Banyuls sur mer (LACM 45884, 6; LACM 80-51, 7 + 3 complete). Pyrenes, Peyrefite near Banyuls (NMBE 1327.15, 3; NMBE 1327.4, 12). Port Vendres (ANSP 50514, 1; USNM 857643, 4). Roussillon Province, Paulilles (LACM 80-40, 1; NMBE 1327.10, 3). Cap d'Agde (NMBE

1327.402, 4). Côte d'Agde (MNHN no #, 3). Sète (MNHN no #, 3). Frontignan (NMBE 1327.405, 1). Marseille (BMNH 1929.10.24.97-101, 5; MNHN no #, 3). Marseille, Endoume (MNHN no #, 1). Bendor (DLG AAB 14as, 10; DLG AAB 14bd, 7). Provence, Iles Embiez (MNHN no #, 1). Sanary (MNHN no #, 1). Toulon (MNHN no #, 1, MHNG 13241, 2). La Seyne (MNHN no #, 1). Hyères, La tour fondue (DLG AAB 14a, 3). Porquerolles (MNHN no #, 2; MNHN no #, 2). Valras (DLG AAB 14j, 4). Ramatuelle, La Bastide Blanche (NMBE 1327.21, 1; NMBE 1327.5, 26). St. Tropez (MNHN no #, 2). St. Tropez, Plage de l'Escalet (NMBE 1327.13, 7; NMBE 1327.6, 2). St. Tropez, Salins (NMBE 1327.11, 3). Near St. Tropez (ANSP 280643, 99; ANSP 280644, 104). St. Raphael (MNHN no #, 2). Antibes (MHNG 17573, 10; MHNG 21228, 2). Nice (NMBE Schuttleworth, 4). Villefranche (MHNG 13242, 2; MHNG 13244, 3). Menton (MNHN no #, 1). Provence, Cap Ferrat (MNHN no #, 1). SE-Corse, Cap la Ciappa (DLG AAB 14ah, 19). Corse (DLG AAB 14h, 1). Corse, Cap Corse (MNHN no #, 3). Corse, Porto Pollo (BMNH no #, 3: complete). Corse, Cargèse (DLG AAB 14bm, 6). Corse, Viviano (MNHN no #, 1). Corse, Ajaccio (MNHN no #, 1; MNHN no #, 4). Gulf of Ajaccis (BMNH 1563, 21). Corse, Sanguinaires Isl. (MNHN no #, 1). Cannes (AMNH 47284, 3; MNHN no #, 1). Roussillon, La Franqui (MNHN no #, 1; MHNG 17574, 28). Roussillon, Collioure (MNHN no #, 4). ITALY: Lovrana (MNHN no #, 1). Trieste (DMNH 119952, 2; SBMNH 28360, 1). Gulf of Trieste, Sistiana Bay (AMNH 198685, 1). Grignano mare, near Trieste (DLG AAB 14bh, 4). Rimini, Cattolica (NMBE 1327.25, 1). Senigallia (MHNG 16240). Ancona (LACM 21741, 2; MHNG 17827, 1). Apulia, T.S. Gennara (DLG AAB 14w, 3). Apulia, Gargano (DMNH 079612, 1). Apulia, Terre Colomela (DLG AAB 14x, 12). Tuscany, N of Piombino, Populonia (DMNH 044178, 5). Elba (BMNH 2258, 1). Montecristo, Cala Scoglio (DLG AAB 14ac, 1). Montecristo, Cala Corfu (DLG AAB 14ad, 1). Montecristo, Cala Maestra (DLG AAB 14ae, 1). Montecristo, Cala St. Maria (DLG AAB 14af, 17). Naples (LACM 60-16, 1; DMNH 175196, 1). Naples, Zoological Station (AMNH 104, 5; NMBE 1327.19, 1). Naples, Napleski (DMNH 130953, 1). Naples, Posilipo (BMNH 1617, 2). W Naples, Golfo di Pozuoli, E Punta di Pennata (LACM 92-107, 15). Capri (SBMNH no #, 2). Cape Miseno (SBMNH 240, 5). Ischia Isl. (SBMNH 206, 1). Sicily, Giardini-Naxos (DLG AAB 14b, 31). E Siciliy (LACM 116523, 2). Sicily, Palermo (BMNH no #, 2; MNHN no #, 1). Sicily, Catania (AMNH 240643, 1). Sicily, Aci Trezza (AMNH 220199, 4). Sicily, Messina (MHNG 13190, 2). Sicily SE, T. Vendicari (NMBE 1327.16, 7; MHNG 13194, 6). Sicily, Mondello (NMBE 1327.17, 2; USNM 179289, 1). Sicily, Melilli Marina (NMBE 1327.18, 1). Sicily, Bay Carini (USNM 710646, 1). Campania, Palinuro (AMNH 230255, 2). Taranto, San Vito (AMNH 249112, 5). Taranto, Marino di Pulsano (AMNH 249111, 3). Porto Cesare (AMNH 239005, 6). Tyrrhenian Sea, Panarea Isl. (AMNH 215140, 1). Portofino, Genova (ANSP 290332, 2). W Brindisi (NMBE 1327.7, 1). Gallipoli (USNM 42098, 4). Sardinia, Porto Ferro (SBMNH WW209, 4). Lampedusa (MHNG 13198, 2). MALTA: (LACM H-2687, 1; LACM A.2777, 2). Delimara Point (BMNH no #, 1). YUGOSLAVIA: Gulf of Piran (USNM 754029, 1: complete; USNM 754013, 3). Istria, Umag (DLG AAB 14e, 1). Porec (DLG AAB 14m, 2). Rovinj (MHNG 13200, 10). Istria, S coast Katarina Isl. off Rovinj (ANSP 332522, 2). Adriatic, Bay of Bakar, Gulf of Kvarner (MHNG 13189, 1). Krk Isl. (USNM 753776, 1). Novi (USNM 753821, 1). Privic Isl. (USNM 753853, 1). Vrulja Cove (USNM 753751, 1: complete). Cres Isl., Osor (DLG AAB 14t, 1). Losinj (DLG AAB 14aj, 1). Mali Losinj, Baldarka (DLG AAB 14u, 2). Dalmatia, Zara (= Zadar) (USNM 179288, 1). Zadar, Zaton (DLG AAB 14v, 3). Makarska 35 miles S of Zadar (LACM A.E.62-45, 8). Pag (DLG AAB 14y, 2). 5 miles N of Primosten, near Split (BMNH 2341, 6). Split (DMNH 029675, 4). Dalmatia, Korcula Isl., Osjak Isl. (LACM A.7759, 2; LACM A.7759, 1). Promontary near Usarica, S of Karlobag (BMNH 2341, 6). Makarska (AMNH 108104, 20). Opatija Beach (ANSP 318018, 1). Dubrovnik (MHNG 21230, 3: MHNG 13201, 6). Dubrovnik, Lorkum (MHNG 21129, 1). GREECE: Corfu (MNHN no #, 2; SBMNH WW2061, 1). Euböa, Limni (DLG AAB 14aa, 1). Crete, Sitia (DLG AAB 14ba, 3). Crete, Sonda Bay, Marthi (NMBE 1327.8, 1). W coast, Preveza (DLG AAB 14bl, 55). Near Athens (BMNH no #, 3). Kefallina Isl. (DMNH 095476, 1; DMNH 095504, 1). Saronikos Gulf (USNM 835593, 1; SBMNH 6174, 1). Poros Isl. (DMNH 095482, 5). Spetsai Isl. (SBMNH 12249, 2). Lemnos (SBMNH WW2040, 2; MHNG 21164, 1). Lesvos [= Lesbos ?] (AMNH 151988, 1). Samos Isl. (AMNH 151989, 1; AMNH 45733, 2). Rhodos (USNM 669298, 1). Kos Isl., Bay of Kalimnos (DLG AAB 14bo, 2). TURKEY: Bodrum (AMNH 239004, 5). Gulf of Atalya (BMNH 2258, 2). Foca (Med. Inlet.), Aegean Sea (USNM 709157, 1). CYPRUS: Ayia Napa (AMNH 275997, 1). SW, Paphos (NMBE 1327.1905, 5; NMBE 1327.1906, 1). N Akamas Peninsula, Bath of Aphrodite (MNHN no #, 1). SYRIA: Tartous (MNHN no #, 3). LEBANON: Beyrout (MNHN no #, 3; USNM 669101, 1). ISRAEL: Haifa, Shymona (DLG AAB 14f, 1). EGYPT: Alexandria (USNM 74545, 3). TUNESIA: Tabarka (USNM 740191, 1). 3 km W of Bechateur (USNM 740264, 1; USNM 740167, 1). Bizerte (DMNH 127665, 1). Gulf of Gabes, Bou Grara (MNHN no #, 3). Tunis, Gulf of Gabes, Gerba/Jerba Isl. (BMNH 2258, 1; BMNH 2258, 2). Ile Djerba, Sidi-Marès near Houmt-Souk Pyrenes, Peyrefite (NMBE 1327.799, 6). ALGERIA: (LACM 45951, 8). Alger (MNHN no #, 3; MNHN no #, 1). Oran (MNHN no #, 1; MNHN no #, 4). MOROCCO: Melilla (LACM 45795, 3; DMNH 011012, 3). Melilla, Cala Charranes (ANSP 215755, 2). Melilla, Lengua de Tierra (ANSP 209639, 3). Melilla, Muelle Norte (ANSP 209640, 1). Tangier (MNHN no #, 4; MNHN no #, 2). Tangier Province, Mdiq (LACM 94-23, 1; MNHN no #, 7). Casablanca (MNHN no #, 1). Tetouan (MNHN no #, 1). Asilah (MNHN no #, 1). Mogador (MNHN no #, 2; MNHN no #, 1). Agadir (MNHN no #, 2; MHNG 21810, 1). 9 km N of Agadir (NMBE 1327.1, 1). SENEGAL: Cap Vert, Ponte des Almadies (LACM 76-48, 1 with dried body). Dakar (USNM 781776, 1).

LITERATURE, LOCALITIES: Messina, Taormina

(Bolognari, 1953). Spain, Vigo; Italy, Beach of Catanzaro; Tunesia, Susa (= Sousse) (Ubaldi, 1987). Akhziv; Bat Gallim; 'Atlit; Dor; Netanya; 'Akko; Haifa (Barash & Danin, 1992). Punta Barcarello (Palermo); Ognina (Siracusa); Isola di Favignana; Taranto; Portofino (Genova); Gulf of Naples; Cala Junco (Panarea Isl.); Orano (Algeria), Jerba (Tunesia) (Gianuzzi-Savelli *et al.*, 1994). Capo Mortola, Ventimiglia; Bordighera; Varazze; Bergeggi ; Punta Manara, Riva Trigoso; Baia del Silenzio, Sestri Levante; Arenzano; Vesima; Bonassola; Elba, Marina di Campo; Elba, Scoglio della Triglia; Piombino, Secca del Cimitero; Baratti; Golfo di Baratti, Piombino; S. Vincenzo; Calafuria; Tarquinia; Isola Palmarola, Arcipelago Pontino; Sorrento; Capo di Sorrento; Seiano; Isola di Vivara; Procida; Punta Pennata; Punta Pioppeto; Miseno; Posillipo; Porto Infreschi; Marina di Ascea; Pioppi; Punta Licosa; Agropoli; Salerno; Marina di Maratea; Capo Vaticano; Santa Domenica di Ricadi; S. Irene, Briatico; Punta Prosciutto; Lido Manduria; Taranto; Torre Pali, S. Maria di Leuca; Marina di Novaglie; Mattinata; Rodi Garganico; Marina di San Vito; Lido Riccio, Ortona Foro; Portonovo; near lake Chioggia; Costa Veneziana, Cavallino; Aurisina Filtri; Isola delle Femmine; Capo Gallo; Milazzo; Isole Lipari; Lipari, Canneto; Aci Trezza; Porto Palo; Vendicari; Siracusa; Augusta, Castelluccio near Brucoli; Pantelleria; Isola Favignana; Favignana; Isola di Marettimo; San Antioco, Spiaggia Canisoni; Torre Cala Regina; Carloforte; Cagliari; Cagliari, Foxi; Villasimius, Isola Cavoli; Villasimius, Secca S. Caterina; Villasimius, Capo Boi; Villasimius, Punta Molentis; Villasimius, Isola Serpentaria; Portoscuso; San Caterina di Pittinuri, is Arenas; San Caterina Pittinuri, S' Archittu; Torre Argentina; Capo Marargiu; Golfo di Arzachena; Isuledda; Cannigione Isuledda; Capo Caccia, Cala della Calcina; Alghero, Scogliera Lazzaretto; Argentiera; Isola dei Gabbiani, Palau; Isola della Maddalena; Isola Santa Maria, Bocche di Bonifacio; Isola Razzali, Poloni (Bedulli *et al.*, 1982).

LITERATURE, RANGE: Channel Isl. - Senegal, Mediterranean (Lindner, 1975). SW Europe to Channel Isl., Mediterranean (Poppe & Goto, 1991: as *tuberculata form lamellosa*). Mediterranean coast of Israel, Egypt, Leganon, Syria, Cyprus, Aegean Sea, Adriatic Sea, Western Basin, Alboran Sea; Atlantik: Spain, Portugal Morocco, Canary Isl. (Barash & Danin, 1992).

Haliotis tuberculata coccinea **Reeve, 1846 (Figs. 10, 11, 14)**

MOROCCO: Cala Charranes, Melilla (ANSP 215756, 2). SPAIN, Malaga, S of Torre Molino, Toroque Brada (ANSP 265699, 10). CANARY ISL.: Lanzarote (LACM 45966, 2; LACM 45915, 3). Lanzarote, Arrecife (AMNH 151987, 1; AMNH 170644, 1). Lanzarote, Orzola (MNHN no #, 5). Lanzarote, Las Coloradas (MNHN no #, 1). Lanzarote, Porto del Carmen (MHNG 21933, 1). Gran Canaria, Las Palmas (ANSP 209637, 1). Gran Canaria, Las Palmas, Las Canteras Beach (LACM 62831, 2). Gran Canaria, Puerto Rico (DLG AAB 14ao, 7). Gran Canaria, Sardina (DMNH 18200, 4). Tenerife (DMNH 155574, 2). Tenerife, Los Christianos (DMNH 179567, 3). Tenerifa, Czuzruy Isl., Bajo Piedros (DLG AAB 14z, 15). Tenerife, Santa Cruz (AMNH 220245, 3; MNHN no #, 8). Tenerifa, Puerto de la Cruz (ANSP 202695, 2; MNBE 1508.651, 11). Tenerife, Punta Hilgado (MNHN no #, 4). Tenerife, La Tejita (MNHN no #, 1; MNHN no #, 1). Tenerife, Las Galletas (MNHN no #, 2). Tenerife, San Andres (MNHN no #, 1). Tenerife, Palm Mar (MNHN no #, 1). Tenerife de Gran Canarias (USNM 636758, 3: complete). La Palma, Santa Cruz de la Palma (MNHN no #, 1). Fuerteventura (DLG AAB 14c, 3). MADEIRA: Santa Cruz (ANSP 88744, 9; DMNH 133467, 4). S-Madeira, Garajau (DLG AAB 14aq, 2). Salvane Isl., Petite Salvage, S Side (BMNH 2324, 5). CAPE VERDE ISL.: (AMNH 19715, 1). Santa Luzia Isl., Curral (AMNH 241649, 2). AZORES: Fayal (AMNH 19680, 3; USNM 31708, 7). Faial, Horta (MNHN no #, 1). Fayal, Castelo Branco (MNHN no #, 3). Graciosa Isl. (BMNH 2341, 12). Graciosa Isl., Ilheu da Praia (MNHN no #, 1). San Miguel, Ponta Galera (MNHN no #, 5; MNHN no #, 1). San Miguel, Ilheu de Vila Franca do Campo (MNHN no #, 1; MNHN no #, 1). San Miguel, N (MNHN no #, 1). San Miguel, S, Roia da Praia (MNHN no #, 18). Santa Maria, NW, Anjos (MNHN no #, 3). Santa Maria, SE, Maia (MNHN no #, 1). Santa Maria, Praia Formosa (MNHN no #, 2). Santa Maria, Ponta do Marvao (MNHN no #, 1). Santa Maria, Vila de Porto (MNHN no #, 1). Flores (BMNH no #, 55). Flores, Ponta Delgada (MNHN no #, 2).

LITERATURE, LOCALITIES: Cartagena, Spain. (Gianuzzi-Savelli *et al.*, 1994).

LITERATURE, RANGE: Canary Isl. (Poppe & Goto, 1991).

South African Species (Figs. 14, 142-145, 148, 151-156, 159-162)

Haliotis midae **Linnaeus, 1758 (Figs. 14, 142-145, 148)**

ANGOLA: Lobito Bay (AMNH 45976, 3; AMNH 46340, 1: doubful, not mapped). SOUTH AFRICA: Saldanha Bay (AMNH 107426, 1). False Bay (AMNH 186964, 11; AMNH 272141, 2). False Bay, Simons Town (AMNH 87538, 3; AMNH 186831, 5). False Bay, Muizenberg (USNM 617743, 4). Cape Town (DMNH 101956, 5; AMNH 45954, 2). Strand (LACM S.2047, 1; LACM 22228, 1). Cape Peninsula, Kommetjie Beach (AMNH 186985, 1). Cape Province, Table Bay (USNM 636759, 7). Kleinmond (LACM A.8487.65, 3; BMNH no #, 3). Cape Province, Onrust (LACM 10736, 1; ANSP 211516, 4). Hermanus (AMNH 205925, 1; NMBE 1330.1169, 1). Hermanus, Abalone factory (BMNH 2341, 1). Hermanus, Gansbaai (BMNH 2341, 1). Cape Province, Buffels Bay (AMNH 240634, 1; AMNH Edison A9853, 15). Cape of Good Hope (ANSP 50215, 1; ANSP uncataloged, 1). Jeffreys Bay (DMNH 049718, 4; LACM 91284, 14). Algoa Bay (DMNH 063297, 1; LACM 11667, 1). Algoa Bay, Cape Recife (LACM 11709, 1; LACM 45913, 2). Gouritz River Mouth (ANSP 211525, 1). Gouritz River Mouth, outer ledges (ANSP 217651, 1). Mossel Bay (LACM A.2777a, 1; AMNH 101550, 2). Knysna (MHNG 21234, 1). Port Elisabeth (BMNH 2341, 1; MNHN no #, 22). Port Elisabeth, Summerstrand (ANSP 276815, 27). Port Alfred (DMNH 012307, 6; DMNH 011028, 1). Port Alfred, Cape Colony (USNM 249895, 1). Port Alfred, Shelly Beach (AMNH 186962, 2). Port Alfred, near

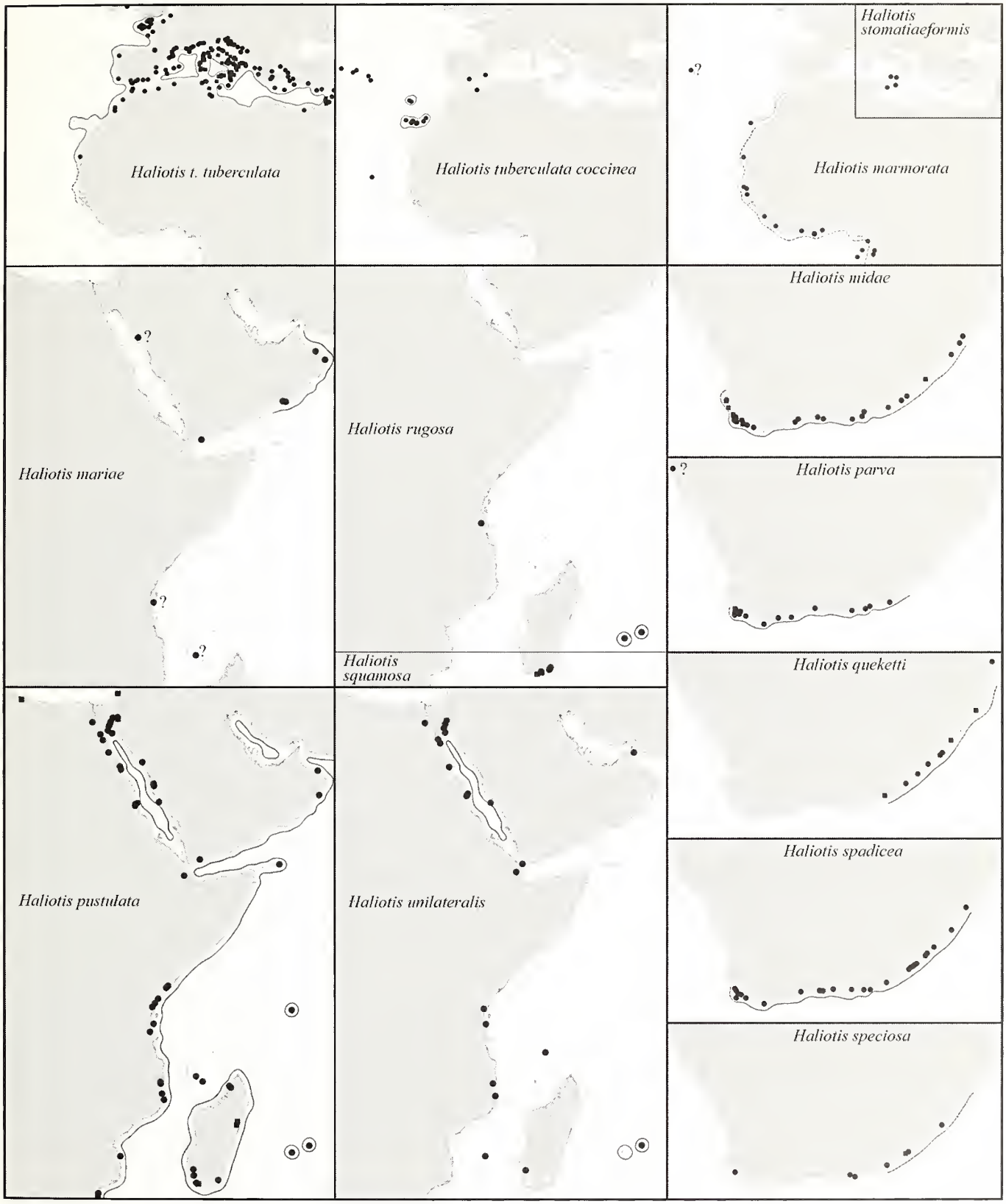


Fig. 14 - Distribution of Mediterranean, west African, and south African species of *Haliotis* spp. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

Grahamstown (USNM 187118, 1; USNM 186886, 3). East London (NMBE 1330.8, 1). East London, Bonza Bay (LACM 28821, 1). London, Shelly Beach (NMBE ex 1510.343, 1). E Cape, Gonubie (AMNH 232367, 2; SBMNH 6186, 5). Ciskei, Haga Haga (AMNH 1869663, 3; AMNH 272140, 2). Morgans Bay, E coast (AMNH ex 200604, 2). Kei Mouth (DMNH 012210, 3). Port Shepstone (LACM A.2777b, 1). Durban (NMBE 1330.294, 1). Capeland, Bushman's River Mouth [= Tugela, at Newark] (USNM 622256, 5).

LITERATURE, LOCALITIES: Stony Point; Dassen Isl.; Dawidskraal (NEWMAN, 1968). Coffee Bay (JACKS, 1983). Saldanha Bay, Marcus Isl.; Mas Bay near Cape Hangklip (BARKAI & GRIFFITHS, 1986).

LITERATURE, RANGE: Table Bay - Port Alfred (BARNARD, 1963). Saldanha Bay - Gonubie (RICHARDS, 1987). Table Bay - Natal (ABBOTT & DANCE, 1983). Saldanha Bay - Gonubie (JACKS, 1983). St. Helena Bay - W Transkei (MULLER, 1984).

Haliotis parva Linnaeus, 1758 (Figs. 14, 154-156)

NAMIBIA: Hottentot, Kleinward Strand (DMNH 012309, 7). SOUTH AFRICA: Cape Town (AMNH 260669, 1; AMNH 207957, 1). Cape Town, Seapoint (DLG AAB 18a, 1). Cape of Good Hope (DMNH 130284, 1; DMNH 133560, 1). False Bay (DMNH 010371, 1; AMNH 276889, 1). False Bay, Muizenberg (USNM 617742, 4). Strand (LACM 45786, 5; LACM 45921, 2). Simonstown (AMNH 87540, 3). Simon's Bay (ANSP 211515, 1). Cape Province, Betty's Point beaches (AMNH Edison A9853, 8). Buffels Bay and Betty's Point (AMNH Edison A9853, 12). Lialguhas [= Agulhas ?] (DMNH 015438, 3; AMNH 272143, 4). Cape L'Alguhas (ANSP 211522, 2). Mosselbaai (DMNH 012311, 8). Jeffreys Bay (DMNH 124169, 3; LACM 45792, 2). Knynsa Cape (SBMNH 38831, 1). Algoa Bay (DMNH 131504, 3; BMNH no #, 1). Port Elisabeth (DLG AAB 18f, 1). Port Alfred (LACM 45856, 1). Port Alfred, near Grahamstown (USNM 187116, 2; USNM 187117, 1). Kleinmond (LACM A.8487.65, 3).

LITERATURE, LOCALITIES: Table Bay; Still Bay (BARNARD, 1963).

LITERATURE, RANGE: False Bay - East London (BARNARD, 1963). False Bay - Gonubie (RICHARDS, 1987). Table Bay; False Bay; Still Bay - Port Elisabeth - Port Alfred - Gonubie (JACKS, 1983).

Haliotis queketti Smith, 1910 (Figs. 14, 161, 162)

SOUTH AFRICA: Transkei, Coffee Bay (DLG AAB 52a, 1; AMNH 145831, 1). Transkei, Xora (AMNH 232440, 1). Pondoland (NMW, 1; DMNH 12312, 4). East London (SBMNH 6654, 1). Natal, Palm Beach (AMNH 272144, 1).

LITERATURE, LOCALITIES: Inhaca Isl. (MACNAE & KALK, 1958). Natal, Isezela; Port Alfred; Natal, Zululand, off O'Neill Peak; Mozambique, Delagoa Bay (= Bahia de Lourenco Marques) (BARNARD, 1963). Northeastern Somalia (GEIGER & PISOR, 1999: not mapped).

LITERATURE, RANGE: Port Alfred - Natal (RICHARDS, 1987). Natal (ABBOTT & DANCE, 1983). Transkei - S Natal (MULLER, 1984). Transkei - KwaZulu (MULLER, 1986).

Haliotis spadicea Donovan, 1808 (Figs. 14, 151-153)

SOUTH AFRICA: Robben Isl. (MNHN no #, 2). Table Bay (DMNH 136950, 2). Cape Town (LACM 45798, 1; ANSP 62750, 1). W Cape Town, near Dehoop Nature Reserve, off Witsands (AMNH 220030, 2). False Bay (LACM 105825, 2; AMNH 141073, 2). False Bay, Saint James (LACM A.2777a, 3). False Bay, Muizenberg (USNM, 603229, 26; USNM 67738, 3). Strand (LACM 22197,1; LACM 45852, 3). Kleinmond (DMNH 012314, 1). Miller Point (AMNH 186881, 3). Simonstown (AMNH 141083, 1; AMNH 87539, 1). Simon's Bay, E Cape Peninsula (ANSP 211513, 3; BMNH 59.11.30.13, 1). Mossel Beach (LACM 34261, 2; LACM A.2777, 2). Cape of Good Hope (LACM 59339, 2; LACM 65-112, 1). Cape L'Algulhas (ANSP 211517, 2; BMNH 1926.10.4.1-3, 3). Plettenberg Bay (BMNH no #, 1; ANSP 189719, 1). Cape Province, Storm River Mouth (BMNH 2341, 6). Jeffreys Bay (LACM A.8589, 2; DMNH 111610, 2). Port Elisabeth (LACM A.5678, 1). Knysa, Port Elisabeth (MNHN no #, >50). Algoa Bay (DMNH 049714, 3; ANSP uncataloged, 2). Port Alfred (LACM 45905, 1; LACM 45914, 2). Port Alfred, near Grahamstown (USNM 186885, 1). East London (LACM 10728, 1; AMNH 96645, 8). East London, Glen Eden (LACM 10706, 2). East Cape, Cintza Reef (AMNH 232366, 4). Gonubie (AMNH 221705, 1). Morgans Bay, E Coast (AMNH 200604, 4). Haga Haga (AMNH 182066, 1; AMNH 272153, 2). Kei Mouth (DMNH 101372, 2). Transkei, Coffee Bay (AMNH 272512, 1). Transkei, Coffee Bay, 1 mile S Urntata River (ANSP 211523, 1; ANSP 211520, 1). Umgazi River (ANSP 211519, 1). Port Shepstone (LACM A.2777b, 1). Bushmans River (= Tugela, at Newark) (DMNH 131510, 3; USNM 622255, 6).

LITERATURE, RANGE: Table Bay - Port Alfred, Durban; Tongaat, Natal (BARNARD, 1963). False Bay - Natal (RICHARDS, 1987). Table Bay - Natal (ABBOTT & DANCE, 1983). Table Bay; False Bay - Durban and Tongaat, Natal (JACKS, 1983). Cape Peninsula, Partridge Point - N Natal, Tongaat (MULLER, 1986).

Haliotis speciosa Reeve, 1846 (Figs. 14, 159, 160)

SENEGAL: Goree (ANSP 50187, 2: doubtful, not mapped). SOUTH AFRICA: Table Bay (DMNH 009591, 4). East London, Gonubie (LACM 29624, 1; AMNH Edison A9853, 1). Jeffreys Bay (AMNH 220128, 1). Port Alfred. (ANSP 193234, 1). Algoa Bay (NMW, 2). Pondoland (NMW, 1; DMNH 12316, 1).

LITERATURE, LOCALITIES: East London; Kowie (= Port Alfred) (JACKS, 1983).

LITERATURE, RANGE: Port Alfred - Natal (TALMADGE, 1958). Pondoland - Kowie - Port Alfred; Natal (BARNARD, 1963). Gonubie - Natal (RICHARDS, 1987). Port Alfred - Natal (JACKS, 1983). Port Alfred - W Transkei (MULLER, 1984).

East African Species (Figs. 14-23, 130, 133, 157, 158, 169, 171)

Haliotis mariae Gray, 1826 (Figs. 14-16)

COMOROS: (BMNH no #, 2: doubtful).

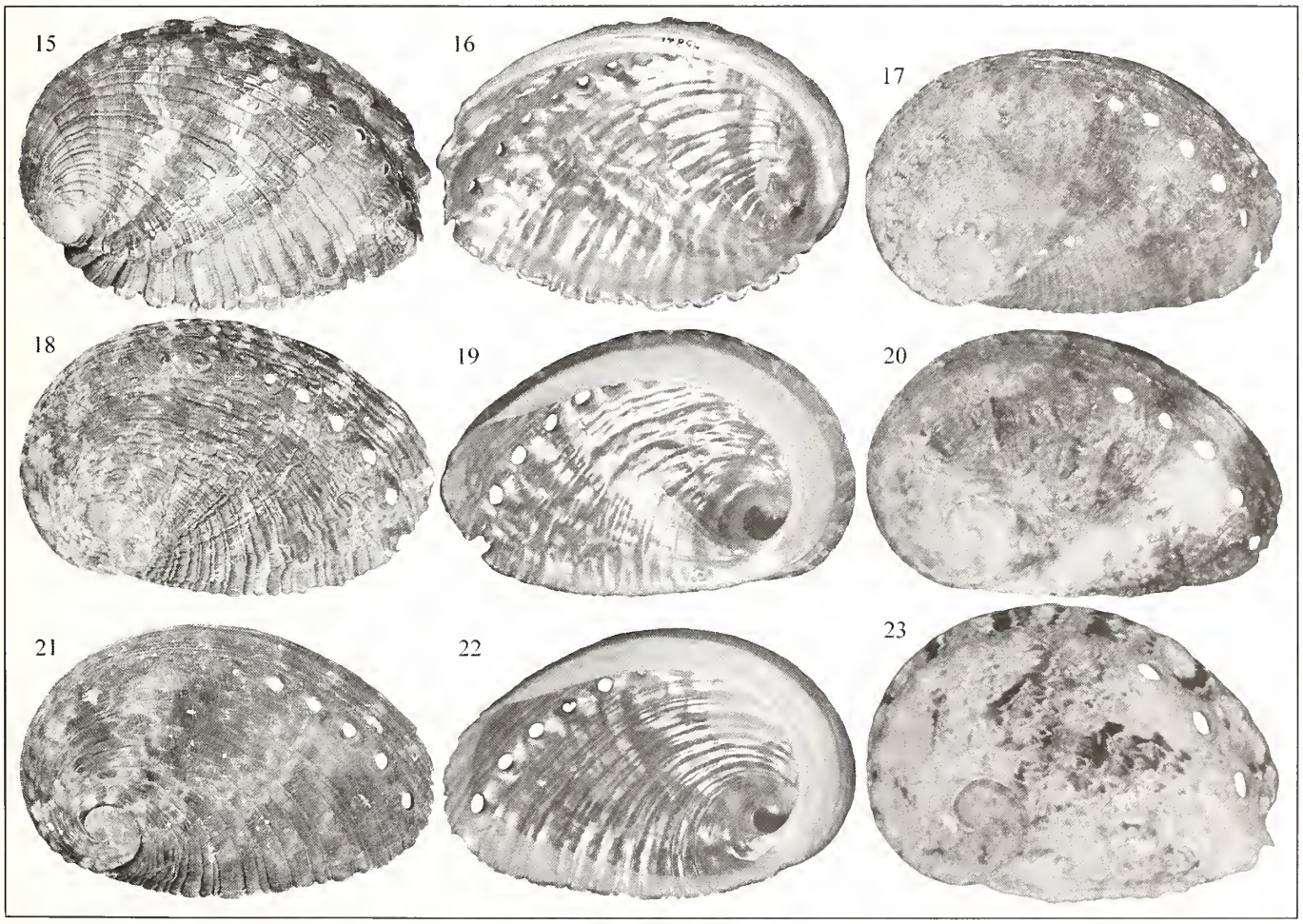
TANZANIA: Zanzibar (BMNH 215,b, 1: doubtful). OMAN:

(DLG AAB 25d, 2 complete + 2 bodies). Muscat (LACM 45821, 3; AMNH 127217, 5). Qurm near Muscat (BMNH Smythe collection, 2). Dhofar province, near Sudh [= Sadh ?], Wadi Haart (LACM 111475, 3; BMNH no #, 7). Masira Isl. (BMNH 2258, 4; BMNH Smythe collection, 4). Taqah (BMNH Smythe collection,1). Near Ras el Hadd (BMNH no #, 2). Near Salalah, Rysut Power Station (BMNH 2375, 1). SAUDI ARABIA: Jedda (DMNH 120252, 9: doubtful). Aden (AMNH 104844, 6: doubtful).

LITERATURE, RANGE: Throughout Oman (Bosch & Bosch, 1981).

Haliotis pustulata Reeve, 1846 (Figs. 14, 17-20)

JORDAN: Aquaba (BMNH 2258, 2). ISRAEL: Elat (AMNH 125441, 2; AMNH 92656, 2). Elat, Angelica Beach (DLG AAB 09e, 1). Elat, Coral Beach (DLG AAB 09d, 1). Gulf of Fara'um [= Faraun ?], Gulf of Elat (USNM 769972, 1: complete; USNM 769990, 2: complete). Gulf of Elat (AMNH 221666, 2; AMNH 220214, 2). EGYPT: Sinai, Dahab, Oasis (DLG 09a, 3; SMF 311910/4, 3). Sinai, Dahab (SMF 311911/3, 3; SMF 311909/1, 1). Sinai, Dahab, Mangrove of Nabq (SMF 311908/1, 1). Sinai, Devilshead (DLG AAB 09c, 3). Sinai, Na'ama Nasra aal Et (DMNH 073898, 4). Sinai, Na'ama, Masra al Et (AMNH 174080, 5). Sinai, Sharm el Sheik, Ras um Sid (DLG AAB 09p, 4). Sinai, Sharm el-Sheik, Ras Mohammed, profile 3 (SMF 311907/1, 1: complete). Sinai, N of Nuweiba (MHNG uncataloged, 4). S Tiran (DLG AAB 09q, 1). Ras Benas (USNM 604098, 1). NW Gulf of Suez, Wadi el Dom (LACM 67-86, 6). 21 km N of Quseir (LACM 67-88, 4). Al-Ghardaqa (=Hurghada) (LACM 8980-68, 1: complete). Hurghagda, Biological Station (EN no #, 1). Umm el (= al) Kiman (AMNH 179941, 1). SAUDI ARABIA: Near Yanbu (BMNH 2363, 1). Jedda (DMNH 121107, 5; DMNH 051062, 4). N of Jedda (AMNH 151133; AMNH 148961, 1). Jedda, 14 km N of (DMNH 120252, 9). Abu Latt Isl. (MNHN no #, 1). Aden (BMNH no #, 1). SUDAN: Port Sudan (AMNH 220221, 1; DMMF IIE-8218, 3: 2 complete). Port Sudan Harbor (BMNH 2341, 1). S of Port Sudan (UR 272, 1). 16 km S of Port Sudan, N Towartit complex, Harvey Reef (BMNH 2341, 3). Sanganeb Atoll, S anchorage (SMF 311906/2, 2: complete). Sanganeb Atoll, N anchorage (SMF 311905/3, 2: complete). 20 km off Muhammed Qol, Shaab Baraia (BMNH 2341, 4; BMNH 2341, 4). DJIBOUTI: Djibouti (MNHN no #, 3). YEMEN: Socotra Isl., Hadibo (UR no #, 3). OMAN: Humer



Figs. 15-23. Shells of East African abalone. Figs. 15-16. *Haliotis mariae* Gray, 1826. LACM 45821. Muscat, Oman. Leg. D. T. Bosch Feb. 1963, ex. coll. Burch. 101 mm. Figs. 17-20 *Haliotis pustulata* Reeve, 1846. Fig. 17. DLG AAB 09r. Elat, Israel. 35 mm. Red variation. Figs. 18-19. DLG AAB 09w. Pemba, N. Mozambique. 41 mm. Dark specimen with deep spiral ridges similar to those in *H. rugosa*. Fig. 20. DLG AAB 09m. Elat, Israel. 30 mm. dorsal. Figs. 21-22. *Haliotis rugosa* Lamarck, 1822. DLG AAB 32a. St. Denis, Reunion Island. 40 mm. Fig. 23. *Haliotis unilateralis* Lamarck, 1822. RP. Na'Ama Bay, Egypt. 21 mm. Specimen with more arched dorsal surface and ledge less pronounced. Compare to Figs. 157, 158 for other specimens.

(BMNH Smythe collection, 1). Qurm near Muscat (BMNH Smythe collection, 1). Muscat (AMNH 127234, 1). KENYA: Malindi, Gedi, Watamu Beach (AMNH 220209, 1). Malindi (USNM 595039, 1). Shimoni (DLG AAB 09j, 4). Shimoni, Wasin Village (BMNH 2241, 1). Mtwapa (NMBE ex 1507.955, 1). Mombassa (BMNH no #, 1; BMNH no #, 2). Faubourg de Mombasa (MNHN no #, 3). Near Mombassa (AMNH 220222, 2; AMNH Edison A9853, 2). TANZANIA: Zanzibar, Kiwenga (DMNH 045981, 4; ANSP 212431, 69). Zanzibar, Je, Boamo, 5 miles S of Paje (ANSP 213154, 16). Zanzibar, Ras Nungwe (ANSP 212799, 23). Zanzibar, Mangapwani (ANSP 212982, 1). Zanzibar, Kizimakazi (ANSP 214118, 4). Zanzibar, Fumba (DMNH 045982, 1). Zanzibar, Kiwengwa (USNM 597238, 1). Zanzibar, Uzoi (AMNH 220218, 5). Zanzibar, Chango (BMNH 1811, 1). S of Mafia Isl. (LACM 45869, 2). Dar es Salam (LACM 45848, 1; DMNH 110695, 10). Dar es Salam, Sinda Isl. (USNM 704049, 2). Dar es Salam, Ras Kankadya (USNM 704020, 2). MOZAMBIQUE: Pemba (DLG AAB 09w, 5). Puerto Amelia (LACM 45853, 3; LACM 111045, 4). Inhaca Isl., Maputo (DLG AAB 09v, 10). Bazaruta Isl. (DMNH 011048, 2). Nacala Bay, Fernão Veloso (NMBE 1505.107, 1; NHBE ex 1507.89, 4). Mozambique Port (AMNH 80450, 3). Mozambique City (AMNH 114807, 6; ANSP 234109, 1). SEYCHELLES: (BMNH no #, 1). COMOROS: Grande Comore, Mitsamiouli (LACM 45935, 4). Mayotte (BMNH no #, 1). MADAGASCAR: Nosy Be (AMNH 220220, 2). Nosy Bé, Andilana (DMNH 045923, 2). Nosy Be, Ambka (AMNH Edison A9853, 2). W Nossi Be, N shore of Nosy Saktia (ANSP 257888, 5). W Nossi Be, Nosy N'Tangam (ANSP 258698, 14). NW Nosy Be, at Andilanda (LACM 89-53, 6: 3 with dried bodies). 13° 31' S 48° 32' E (USNM 719376, 1). Tulear (LACM 144277, 2; MNHN no #, 1). Tulear, Infati (SBMNH no #, 2; DLG AAB 09u, 2). N Tulear, Mora Mora (LACM 144355, 1; LACM 89-50, 1: complete). Anakao (DLG AAB 09s, 3). Between Fort Dauphin and Monantenina (DLG AAB 09y, 13). Androka (MNHN no #, 1). REUNION: (LACM A.2777, 3; BMNH 1829, 2). Cap Homard (DMNH 179566, 4). 2 km S of St. Leu (LACM 89-60, 2: complete). St. Giller (DLG AAB 09k, 2). MAURITIUS: (LACM S.1051, 2; LACM 22227, 1). 0.25 miles N of Black River Bay (DMNH 045913, 7). 1 miles W of Black River (ANSP 273941, 1). S side Tombeau Bay (ANSP 272160, 1). Port Louis (USNM 149075, 1).

LITERATURE, LOCALITIES: Madagascar, Ampalaza, Nosy Manitsa; Foulpointe; Tamatave (DAUTZENBERG, 1929). S of Aqaba (MERGNER, 1979). Akhziv, Shiqmona (TALMADGE, 1971; FAINZILBER, 1984; BARASH & DANIN, 1992). RSA, N Kwa Zulu, Kosi Bay (MULLER, 1984). Lybia, Tobruk (GIANUZZI-SAVELLI *et al.*, 1994).

LITERATURE, RANGE: Mozambique; Madagascar; Zanzibar; Kenya; Red Sea; Ceylon - S India; Mauritius (TALMADGE, 1956). Persian Gulf; E Africa; Somaliland; Red Sea (TALMADGE, 1974). Red Sea (SHARABATI, 1984: as *varia*). Gulf of Suez, NW Indian Ocean (ABBOTT & DANCE, 1983: as *ancile*). Gulf of Suez and Elat; Red Sea; Madagascar; Seychelles; Mauritius (BARASH & DANIN, 1992).

Haliotis rugosa **Lamarck, 1822 (Figs. 14, 21, 22)**

MOZAMBIQUE: (DLG AAB 32b, 1). REUNION: 2 km S of St. Leu (LACM 89-60, 3, 1 with dried body). N of St. Gilles (LACM 89-59, 1; LACM 89-58, 1). St Denis (DLG AAB 32a, 1). Saint Paul (ANSP 301680, 4). St. Pierre (MNHN no #, 1). MAURITIUS: (AMNH 220217, 1; ANSP 50202, 1). Mauritius, S side Tombeau Bay, W (ANSP 399932, 1). SOUTH AFRICA: Jeffreys Bay (AMNH 220224, 1: not mapped).

LITERATURE, RANGE: Maurice, Reunion (DRIVAS & JAY, 1988: as *pustulata*).

Haliotis squamosa **Gray, 1826 (Figs. 14, 130, 133)**

MADAGASCAR: Ambovomby (AMNH 226476, 1). Ambovomby, South M'car (DLG AAB 33b, 1). Fort Dauphin (SBMNH no #, 2). Between Fort Dauphin and Monantenina (DLG AAB 33c, 1).

LITERATURE, LOCALITIES: Madagascar, Ikouko near Ambovombé; Faux-Cap (DAUTZENBERG, 1932).

Haliotis unilateralis **Lamarck, 1822 (Figs. 14, 23, 157, 158, 169, 171)**

ISRAEL: Elat (Neotype MHNG 18020, 1; DLG 48a, 1). Elat, Coral Beach (ANSP 350490, 2). Off Elat (KAS no #: 6). EGYPT: Zafarana (MNHN no #, 1). 30 km South of Elat (SBS, 2). Sinai, Lagoon of Dahab (SBS, 1). Sinai, Dahab (SBS, 1). Sinai, Na'ama Bay (SBS, 1). Tiran, Jackson Reef (SBS, 1). Safaga (RP, 1). SAUDI ARABIA: Abu Latt Isl. (MNHN no #, 2). Bab-el-Mandeb, ME5 stat. 236Ku (SMF 311920/1, 1). DJIBUITI: (MNHN no #, 5; MNHN no #, 6). Ille des 7 frères (Stewart: 1; BMNH, 1). Ouaramous Isl. (KAS, 1). Gulf of Tadjoura, Moucha Isl. (AMNH 164632, 1 [?]). SUDAN: 20 km off Muhammed Qol, Shaab Baraia (BMNH 2341, 1). Port Sudan, Wingate Reef, S. Point (SMF 311905/1, 1: complete). Sanganeb Atoll (SMF 311915/1, 1). Sanganeb Atoll, N side lagoon (SMF 311904/1, 1). Sanganeb Atoll, N anchorage (SMF ex 311905/3, 2: complete). UNITED ARAB EMIRATES: 500-800 nautical miles N of Lulayyah Port, 25° 24' N 56° 22' E (SMF 311903/1, 1: complete). Gulf of Oman, Sharja, Hkor Fakkan, Martini Rocks, stat. 22, 25° 20' 73" N 56° 22' 16" E (SMF 311922/4, 4). KENYA: Shimoni, Ras Rashid (BMNH 2241, 1). ALDABRA: Ile Picard, Passé Dubois (USNM 836532, 1). MOZAMBIQUE: Channel: Bassas Da India (KAS no #, 1). Nacala Bay, Fernão Veloso (NMBE ex 1505.107, 26). Porto Amelia (AMNH ex 220215, 1). ZANZIBAR: (DMNH 001358). Pinna (CASIZ 1594, 1). Uzoi (AMNH 220218, 3). MADAGASCAR: Tulear (MNHN no #, 1; MNHN no #, 1). MAURITIUS (CASIZ 1532, 3; BMNH 2305, 2; BMNH no #, 3). Pointe Fayette (ANSP 273696, 1). NW side of Tamarin Bay (ANSP 273545, 6). Vcoas Point, 3 miles S Mahebourg (ANSP 274167, 1). Matson Point, Grand Bay (ANSP 273031, 1). SE side Tamarin Bay (ANSP 273478, 17).

LITERATURE, RANGE: Red Sea (SHARABATI, 1984: as cf. *pustulata*). Maurice, Reunion (DRIVAS & JAY, 1988: as *varia*).

Indo-Pacific and Central Pacific Species (Figs. 24-44, 63, 66, 116, 117, 119, 120, 122-129, 136-141, 163-166, 175, 176)

Haliotis asinina **Linnaeus, 1758 (Figs. 35, 36, 43, 165, 166)**

ANDAMANES: (DLG AAB 01h, 5; BMNH). Port Blair

(BMNH 1838, 1). THAILAND: Koh Phuket, Ao Rawai (USNM 661782, 1). Phuket, E Kaew Yai Isl. (LACM 85-5, 1: complete). Phuket Isl., Airport Beach (ANSP 286645, 1). Phuket Isl., Laam Ka, Rawai Beach (ANSP 286053, 1). Butang Group, Pulau Tanga (USNM 661644, 3). Goh Sindarar Nua (Chance Isl.) (USNM 661341, 1). SINGAPORE: (ANSP 50241, 2; MNHN no #, 2). VIETNAM: (AMNH 110486, 1). Nha Trang Harbor, Ahn Tre Isl. (AMNH 156199, 1; SBMNH 03511, 2). Nha Trang (MNHN no #, 2). Paracels (MNHN no #, 1). CHINA: (AMNH 19723, 18; AMNH 19724, 3). JAPAN: Honshu, Wakayama, Shirahama, Kii (AMNH 220141, 1; LACM 45971, 2). Kyushu, Nagasaki, Enoshima (BMNH 1838, 1). Okinawa, Machinoto (DMNH 140587, 3). Okinawa, Bolo Point (LACM 28828, 12; AMNH 156001, 5). Okinawa, off centre of Kadina Circle sea wall (AMNH Jackson 1992 A9873, 14). Okinawa, Hyakuna Reef (AMNH 220140, 2). Okinawa, Shioya, Shanawan Bay (USNM 589031, 1). Okinawa, off Oginmi (USNM 488037, 1). Okinawa, Onna Village, Horseshoe Cliffs (USNM 841169, 1). Okinawa, Naha Airport (SBMNH no #, 3). Okinawa, Kadena Reef (SBMNH 25867, 1). Okinawa, Chinen Tide flat (SBMNH Albert #0-304, 2). Okinawa, Moon Beach (SBMNH Hanselman #747-749, 3; SBMNH Hanselman #2767, 2768, 2773, 2774, 4). Okinawa, Zampa-misaki reef (SBMNH no #, 1). Irimote (SBMNH Albert

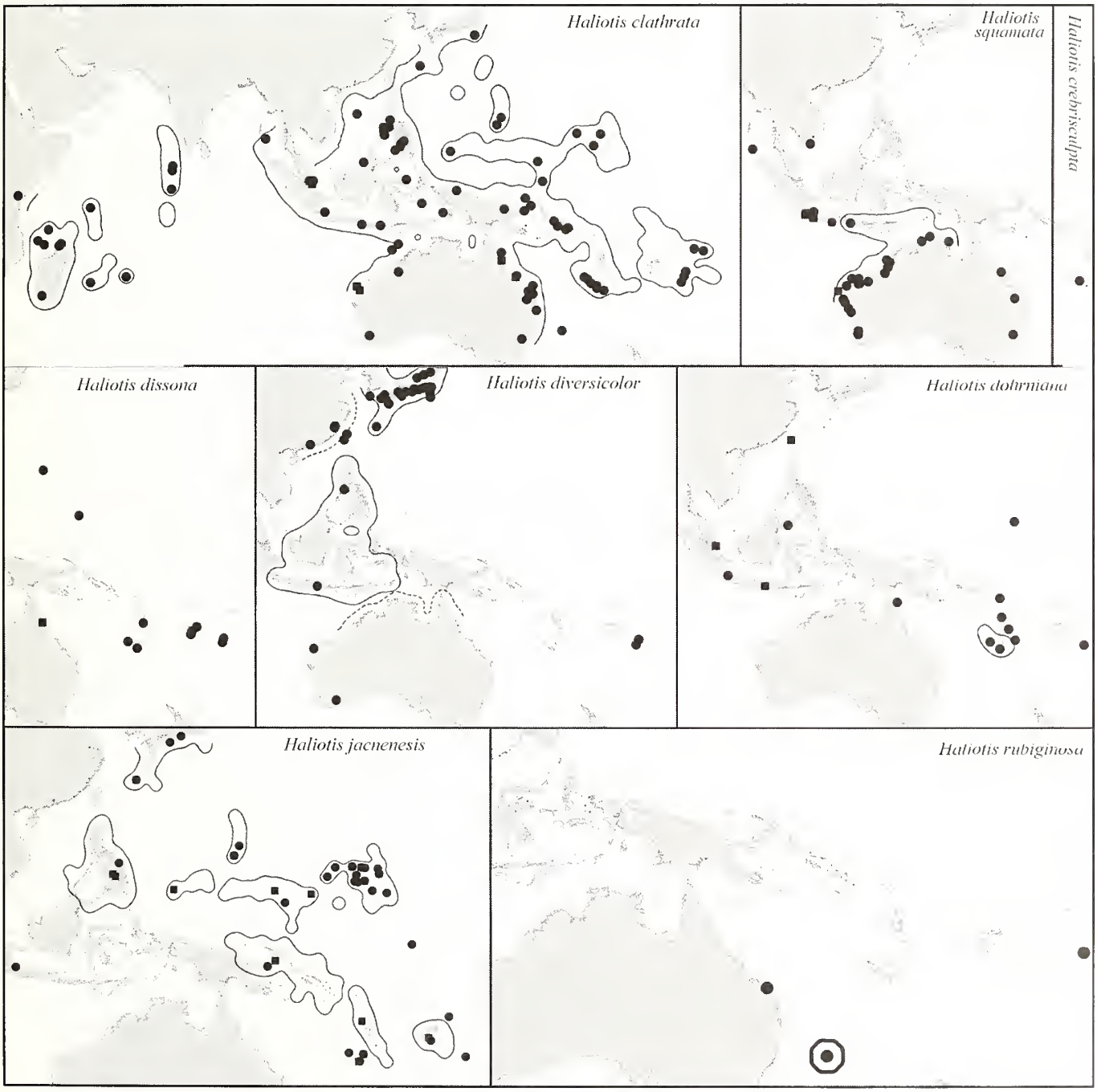
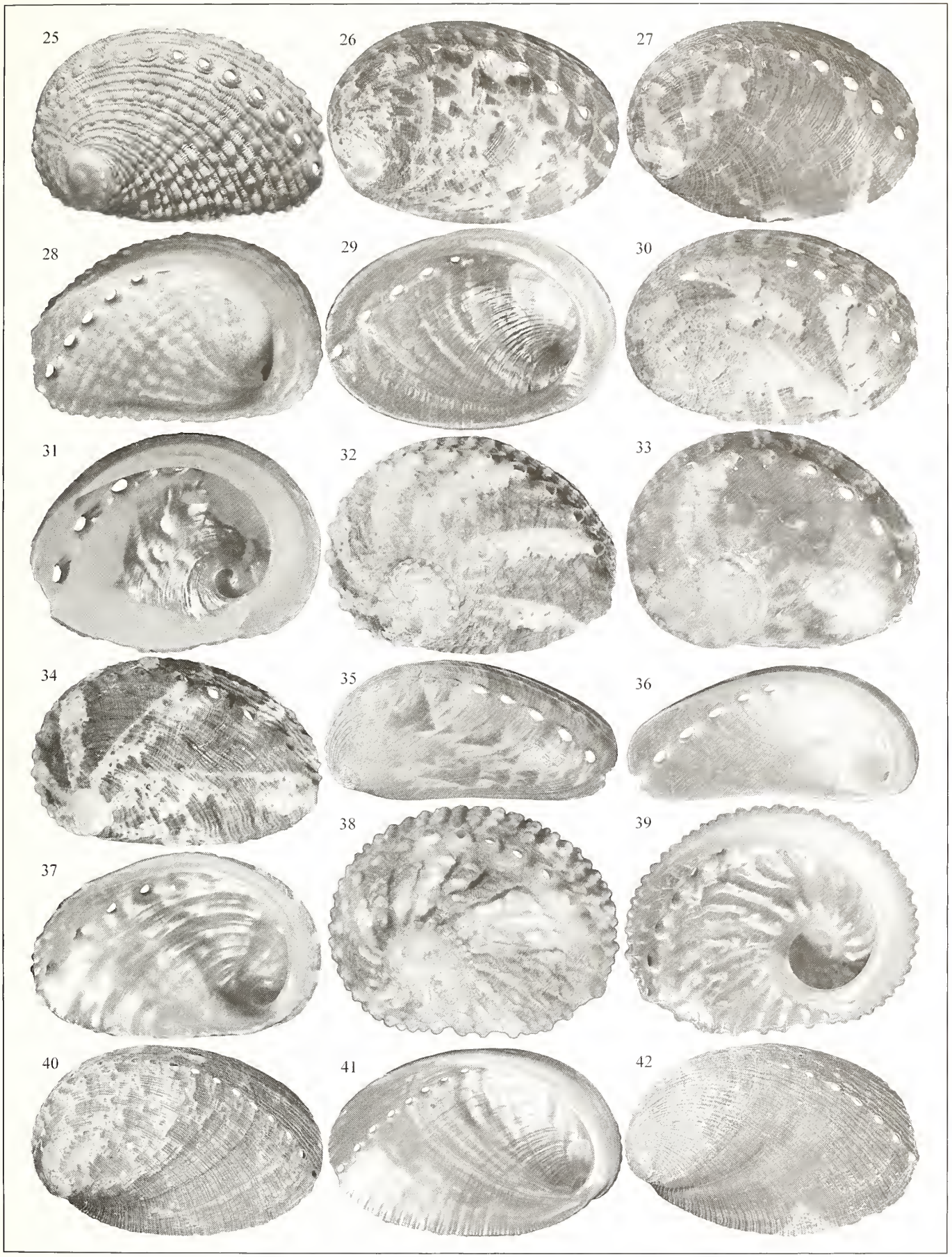


Fig. 24. Distribution of Indo-Pacific species of *Haliotis* sp. (I). For data see text.Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

#0-304, 1). PHILIPPINES: Luzon, Batangas (DMNH 187792, 1). Luzon, Batangas, Calatagan (DMNH 004401, 2). Luzon, W Quezon (DMNH 188659, 1). Luzon, E Quezon (DMNH 189644, 1). Luzon, Quezon, Bondoc Peninsula (DMNH 193733, 1). Luzon, Bataan Province, Luson (LACM 152166, 1). Luzon, Zambales, Iba (ANSP 229239, 1). Luzon, Lingayen Gulf, Pangasinan (DMNH 193445, 1). Luzon, Lingayen Gulf, Pangasinan, Nara Isl. (DMNH 193621, 4). Luzon, Sorsogon, Magallanes (AMNH 80267, 9; ANSP 223930, 12). Luzon, Sorsogon, Badang, near Gubat (ANSP 224376, 6). Luzon, Sorsogon, Matnog (LACM 83718, 2). Luzon, Albay, Tabaco Bay (LACM 31800, 2). Luzon, Albay, Libon (LACM 83799, 1). Samar (DMNH 192521, 7; MHNG 21817, 1). E Samar, Borogan Village (ANSP 223337, 1). Mindoro, Calapan (AMNH 80446, 4; AMNH 121973, 4). Mindoro, Calapan, Baco Isl. (DMNH 049140, 5). Mindoro, Puerto Galero, Little Balateros Cove (DMNH 192764, 3). Mindoro, Cabra Isl. (LACM A.2777a, 2). Mindoro, Dalaovan (LACM 120218, 1). Mindoro, Pola (AMNH 98957, 1). Mindoro, Mansalay Bay (USNM 245532, 3). Mindoro, off Point Calavite (USNM 632562, 1: complete). Marinduque, Boac (DMNH 187195, 1). Mindanao, off Zamboanga, Bilau-Bilau Isl. (USNM 245539, 1). Mindanao, off Zamboanga, Bilau Bilau Isl., off Moros (USNM 245507, 18). Mindanao, off Zamboanga, Pangapuyan Isl. (USNM 245540, 2). Mindanao, Zamboanga (LACM AHF Acc. 1205, 8; AMNH 220142, 18). Mindanao, Zamboanga, Bilan-bilan Isl. (DMNH 043910, 3). Mindanao, Zamboanga, Santa Cruz Isl. (LACM 81-6, 1). Mindanao, Davao Bay (DMNH 118539, 3). Mindanao, Davao, Gulf of Mindanao, Davao City (USNM 747831, 3). Mindanao, Surigao Province (LACM 74720, 1). Mindanao, Misamis Occ., Calamba (AMNH 184049, 1). Panay, Iloilo, Bagacy (DMNH 192020, 1). Panay, Antique, San Royal (DMNH 192334, 1). Cebu (LACM A. 2777c, 4; AMNH 80430, 1). Cebu, Olango Isl. (DMNH 002169, 11; AMNH 80210, 4). Cebu, off Olango, Cawhagen Isl. (ANSP 231846, 1). E Cebu, 2 km S of Olango Isl., Salpa Isl. (ANSP 230484, 2). E Cebu, off Mactan, Hilutungan Isl. (LACM 81-4, 1). Cebu, Bantayan Isl. (LACM 45938, 1; DMNH 122436, 3). Cebu, Malaboyoc (ANSP 104363, 1). Cebu, Mad., Kaongrad (ANSP uncataloged, 3). Cebu, Cebu City (USNM 631426, 4). Cebu, Cebu City, Camotes Sea (SBMNH 2719, 12). Mactan (USNM 245515, 3). Masbate Isl. (DMNH 176115, 3). Leyte Isl. (DMNH 194172, 2). Leyte Isl., Villaba (AMNH Edison A9853, 2). Leyte, Villaka (AMNH 240626, 8). Bohol (DLG 01i, 3). Bohol, Mantacas Isl. (USNM 245521, 3). NW end of Bohol, E side Jagoliao Isl. (ANSP 231453, 1). N Palawan (LACM 90283, 2; 74725, 2). Palawan, Cuyo Isl. (DMNH 002253, 6; ANSP 223517, 5). Palawan, Calamian Isl., Lusong Isl., Busuanga (DMNH 178901, 2; DMNH 178163, 1). Palawan, Calamian Group, Manglet Isl. (LACM 74702, 1). Palawan, Culion (SBMNH no #, 2). Palawan, Ulugan Bay (USNM 245496, 2). S Palawan, Balbac (LACM 74740, 17). N Basilan Isl. (USNM 245554, 1). Sulu Archipelago, Siasi (USNM 589461, 4). Sulu Archipelago, Siasi and Bongao Isl. (USNM 313982, 1). Sulu Archipelago, SW of Siasi Isl. (DMNH 028209, 2). Sulu Archipelago, SW of Siasi Isl., W of Caluman Isl. (ANSP 318826, 11). Sulu Archipelago, Siasi Isl., Jolo Isl. (DMNH 049412, 5; AMNH 105908, 4). Sulu Archipelago, Jolo (LACM 90417, 2). Off Sulu Archipelago, Jolo Isl., Muobo Beach (ANSP 318191, 6). Sulu Archipelago, Bongao Channel, SW end Sanga Sanga Isl. (ANSP 230776, 7). Sulu Archipelago, Tabawan Isl. (ANSP 314975, 7). Sulu Archipelago, SW of Tabawan Isl., Nusa Isl. (ANSP 318273, 1). Sulu Archipelago, Dammai Isl. (USNM 245550, 1). Sulu Archipelago, Tawi Tawi Group, Papatag Isl. (USNM 245523, 1). Sulu Archipelago, Tawi Tawi Group, Simonor Isl. (= Simunul) (USNM 245544, 1). Negros (LACM 45959, 1). Negros, Near Giligaon, N of Maloh 09° 06' 30" N 122° 55' 24" E (USNM 828722, 1: complete). Siquijor Isl., W of Little Point (USNM 828682, 1: complete). Catanduanes, Gigmoto (ANSP 223081, 1). PALAU (= BELAU): (AMNH 220138). Rattakadokoru Isl. (DMNH 069888, 1). SW Rattakadokoru Isl. (ANSP 201667, 3). Babelthuap Isl. (DMNH 046177, 1). S Babelthuap Isl., W Passage (ANSP 200961, 2; ANSP 200898, 2). E Babelthuap Isl., Reef 1 mile S of Namelakl Pass (ANSP 203162, 1). Babelthuap Isl., Bridge Jetty (SBMNH no #, 2). Reef S of W Babelthuap Isl., Karamando Bay (ANSP 200982, 1). Malakal Harbor (ANSP 202838, 1). Koror to Malaical, shore by causeway (ANSP 283702, 1). Koror Isl., Near Ferry Dock (ANSP 202962, 1). Reef N of Garokottan Isl. (ANSP 201231, 1). Ngargersiul Isl. (USNM 620863, 1). MALAYSIA: Borneo, Sabah, Banggi Isl. (NMW). Borneo, Sabah, Jesselton (DMNH 059708, 2). Borneo, Sabah, Jesselton, Tamjong Aru (ANSP 275048, 10; USNM 658296, 6). Borneo, Sabah, Sempora (BMNH 2277, 1). Borneo, Sabah, Semporna reef (ANSP 295384, 3). Borneo, Kudat District (ANSP 255709, 1; ANSP 255709, 1). Borneo, Mandi Darrah Isl. (AMNH 106758, 1; USNM 633464, 3). INDONESIA: Sumatra, Batavia/Jakarta (MNHN no #, 1). Off Sumatra, Pulau Bai, Batu Group (USNM 654482, 6). W Bali (LACM 45897, 2). Bali, Sanur (DLG 01d, 1; DLG 01g, 6). Bali, Nusa Dua (LACM 86-164, 2: complete). Bali, Denpasar (USNM 660546, 1). Sulawesi, Manado (DLG 01e, 3). Ceram, Piru Bay, Tg Tutuhuhur (USNM 746703, 1: complete). Aroe and Tenimber Isl. (NHB 1707c, 7). Tanimbar, Selaru, Tg Tuwaum (USNM 747661, 2). Tanimbar, central N shore Larat Isl. (USNM 747525, 2: complete). Lompok (DLG

Figs. 25-42. Shells of Indo-Pacific abalone. Figs. 25, 28. *Haliotis crebrisculpta* Sowerby, 1914. BMNH 1919.12.31.19. "New Caledonia". 30 mm. Lectotype selected by Stewart & Geiger (1999). Figs. 26, 27, 29, 30. *Haliotis glabra* Gmelin, 1791. Figs. 26, 29. DLG AAB 19b. Kushinoto, Wakayama Preference, Japan. 40 mm. Typical color pattern. Fig. 27. DLG AAB 19b. Kushinoto, Wakayama Preference, Japan. II 1987. 40 mm. Unkommon dark color pattern. Fig. 30. DLG AAB 19c. Kushinoto, Wakayama Preference, Japan. 40 mm. Light color pattern. Figs. 31-33. *Haliotis ovina* Gmelin, 1791. Fig. 31. JK. Site 88, Astrolabe Reef, Fiji. 39 mm. Ventral view. Fig. 32. DLG AAB 26h. Phuket, Thailand. 56 mm. Typical green variation. Fig. 33. DLG AAB 26a. Helengeli, Maldives. 41 mm. Figs. 34, 37. *Haliotis varia* Linnaeus, 1758. DLG AAB 15f. No locality. 44 mm. Typical specimen of this extremely variable species. Figs. 35, 36. *Haliotis asinina* Linnaeus, 1758. DLG AAB 01o. No locality. 66 mm. Typical green specimen. Figs. 38-39. *Haliotis pulcherrima* Gmelin, 1791. DLG AAB 34a. Anaa, Takapoto, Niau atoll, Tuamotu. 25 mm. 40-42. *Haliotis diversicolor* Reeve, 1846. Figs. 40, 41. DLG AAB 04a. Japan. 68 mm. Green finely mottled specimen. Fig. 42. DLG AAB 29 a. No locality. 74 mm. Red, coarsely mottled specimen.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no #, 1: complete). NW Lompok, S Ajer (= Gili Air) (LACM 88-62, 1). Lompok, Senggigi Beach, Mangait Point (SBMNH 5618, 2). N of Java, Thousand Isl. (AMNH 187261, 1). Molluccas (= Maluku) (NMW). Molluccas, Ambon (BMNH 2525, 1; NMBE 1517.394, 3). Molluccas, Nuhu Jaan, Elat Bay, W Nuhu Tjut, Kai Isl. (USNM 747138, 1: complete). Molluccas, N Toba Isl., N of Aru (USNM 747881, 3: complete). Irian Jaya, Sarong (NMBE 1517.381, 2). Irian Jaya, Biak Isl. (AMNH 99225, 2; USNM 600642, 10). Irian Jaya, Biak Isl., NR, KLM, Resthouse, 1 mile E of Dock (ANSP 206481, 5). Irian Jaya, Biak dock-reef, about 1.5 miles SW of (ANSP 206359, 2). Irian Jaya, Biak, Noesi Isl. (SBMNH no #, 1). Irian Barat, Noesi Isle, Mios Woendi Atoll, Reef E of Padaido Isl. (ANSP 205038, 1). Irian Jaya, Rani Isl., 20 miles W of Biak Isl., Reef and Isl. 5 miles NW of (ANSP 206704, 7). Irian Jaya, Yapen, W Samberbaba, Cape Tekopi (ANSP 205167, 2). Irian Jaya, near Hollandia (USNM 611881, 2). New Brittain Isl., Rabaul Harbor (ANSP 274806, 5). New Brittain Isl., Rabaul (ANSP 274806, 5). New Brittain Isl., 5 miles from Rabaul, Matapit Isl. (ANSP 304650, 4). Barat Java, S Noekori Isl., E Padaido Isl. (ANSP 206178, 1). Irian Barat, Abroeki Isl., Maransabadi Isl., Aoeri Isl., Geelvink Bay (ANSP 208693, 1). PNG: Kapa Kapa (DMNH 047218, 3). Aitape, Seleo Isl., NW reef (USNM 616056, 1). Trobriand Group, Kiriwina Isl., Wawela (SBMNH 2322, 1). Port Moresby, Ela Beach (LACM 81-22, 1: complete). Bougainville (LACM 45878, 4). Bougainville, Buin (LACM 45895, 1). Admirality Isl., Manus (AMNH 220139, 1; USNM 611713, 1). SOLOMON ISL.: Bougainville, Buka Isl. (USNM 835589, 1). Malaita, N Malaita Isl. (DMNH 050869, 4). Malaita, Auki (DMNH 046839, 1). Malaita Isl., Ataa (AMNH 118203, 2; ANSP 289634, 3). Santa Cruz Isl. (LACM 45958, 1). Santa Cruz Group, Reef Isl., Pigeon Isl., lagoon (SBMNH Phillips# B3378, 2; SBMNH 1218, 5). Shortland Isl. (ANSP 310065, 1). Bungana Isl. (BMNH 2144, 1). Nggela Isl. (USNM 770325, 1). Guadalcanal, Marui/Marau Sound, Tavanipupu Isl. (SBMNH 3504, 1; SBMNH 1407, 4). NEW CALEDONIA: Loyality Isl., Relais de We, Chauteubraind (DMNH 116414, 1). FIJI: Viti Levu (LACM 45980, 2). QLD.: Torres Straits (LACM 22189, 3). Torres Strait, Moa Isl. (BMNH 2341, 1). GBR, Hardy Reef (AMNH 104584, 2; AMNH 249918, 1). Lizard Isl. (USNM 795188, 1: complete). Low Isl. (LACM 45892, 2). Green Isl. (DMNH 010960, 4; ANSP 234368, 1). Off Cairns (MHNG 21813, 1). Cairns, reef (DMNH 031902, 25). Cairns, Double Isl. (ANSP uncataloged, 4). GBR, Fitzroy Lagoon (AMNH 144301, 1). GBR, Holbourne Isl. (ANSP 134536, 1). Bowen (DMNH 127389, 2; LACM 63170, 1). E of Whitsunday Passage, Hawk Reef (AMNH 104760, 1). Whitsunday Isl., Lindeman Isl. (LACM P.465.62, 3). GBR, Capricorn Group, Tryon Isl. (LACM A.8589, 1; LACM 25763, 4). GBR, Capricorn Group, Heron Isl. (LACM 45933, 1; AMNH 95698, 1). GBR, Capricorn Group, NW Isl. (LACM 45941, 5; ANSP 236300, 1). GBR, Capricorn Group, One Tree Isl. (ANSP 236317, 1). Capricorn Isl., Wreck Isl. (SBMNH WW2331, 1). Yeppon (SBMNH 191, 7). Yeppon, Keppel Bay, Keppel Isl. (SBMNH 181, 7). Keppel Isl. (AMNH 208300, 2). Near Gladstone (USNM 595680, 1). Gladstone, Tryon Isl. (SBMNH 23915, 2). Lady Elliott Isl. (ANSP 219616, 1). Shallow Bay (LACM 45968, 3). NT: Darnley Isl. (LACM A.2777b, 2; LACM 110388, 1). Yirrkala, Arnhem Land (AMNH 105237, 3). WA: NE of Onslow, Passage Isl. (LACM 95-64, 2 + 1 complete). Roebourne (LACM 34284, 1). Port Headland (AMNH 121841, 1). King Sound (AMNH 199648, 2). King Sound, Sunday Isl. (AMNH 199649, 3). Scott Reef (AMNH 272131, 1; USNM 681666, 2). Barrow Isl., S end Harcourt Bay (USNM 691911, 1: complete). NSW: Sydney, Port Jackson (BMNH, 2: complete). SA: St. Vincents Gulf (LACM 45962, 12).

LITERATURE, LOCALITIES: WA, Ningaloo Marine Park (Wilson, 1993). WA, North West Islet; NT, Murray Isl. (Cotton, 1943). Komodo (Dauphin & Denis, 1995). Molluccas, Halmahera (Oostingh, 1925). Banda Neira (Adam & Leloup, 1938). Fiji, Viti Levu, Suva; Loyality Isl., Lifu; Guam (Talmadge, 1963). N of Penang (8° 30' N 98° 00' E) (Talmadge, 1974). Kepulauan Seribu (Stewart, 1986). Sulawesi, Gunung Tangkoko/Dua Saudara Park (Kittel, 1993). Indonesia, Batang Isl. (Baer & Baer, 1993).

LITERATURE, RANGE: NSW (Allen, 1959). S-most isl. of Japan and S (Kira, 1962). Ryukyu; Philippines; Indonesia; New Guinea; Solomon Isl.; New Caledonia; Fiji; Loyality Isl.; Marianas; Caroline Isl.; GBR; N Australia; Japan (Talmadge, 1963). Indonesia; N and E Australia; Marianas; Philippines; China; Ryukyu; Amami Isl.; Indian Ocean (Habe & Kosuge, 1964). PNG (Hinton, 1972). North West Cape - QLD (Wells & Bryce, 1985). Philippines (Springsteen & Leobrera, 1986). Indonesia (Dharma, 1988). North West Cape - Capricorn and Bunker Group (Wilson, 1993). Thailand, Malaysia, Australia, Indonesia, Borneo, Philippines, Japan, Okinawa, Taiwan, New Caledonia, Belau, Solomon Isl. (Gosliner *et al.*, 1996).

Haliotis clathrata **Reeve, 1846 (*non* Lichtenstein, 1794) (Figs. 24, 138, 141, 175, 176)**

KENYA: (BMNH 241, 1). MADAGASCAR: Tulear (MNHN no #, 2). 25 km N of Tulear, Mora Mora Village (KAS no #, 2). Nosi Bé, N Nosy Komba, Pointe Ambarionaombi (ANSP 258629, 1). SW Nosi Bé, between Ambatoloaka and Madirokely (ANSP 259131, 2). COMOROS: (DLG no #, 1: complete). Sandy Isl., Mayotte (NM J9665, 1). Anjouan: (BMNH no #, 1). Mayotte, Benthedi, N Pamanzi Isl., 12° 45' 01" S 45° 17' 09" E (MNHN sta. S32, 10). MAURITIUS: (DMNH ex 011016, 3). Belle Mare (CASIZ 044963, 2: complete). Trou aux Biches, Lagon (MNHN no #, 1). ALDABRA ATOLL: Picard Isl. (USNM 836531, 1). SEYCHELLES: (BMNH no #, 1). RODRIGUES ISL.: (BMNH 76.5.1.72, 1). Pt. Mathwesi (DLG 44g, 1; KAS no #, 1). CHAGOS ARCHIPELAGO: Ile du Coin, Peros Banhos (BMNH, 1). Peros Banhos, Ile Poule, seaward reef slope (BMNH 2307, 1). MALDIVE ISL.: Gan Addu Atoll, south reef (BMNH, 1). Ari Atoll, NE of Feridu Isl., Islet 5.5 km NE of Feridu Isl. (ANSP 303927, 1: complete). Helengeli [= Helengili] (A. Faucci collection, 23). ANDAMAN ISL.: 80 km E of S Andaman Isl., N end of Invisible Bank (ANSP 292648,

2). SINGAPORE: (BMNH; ANSP 196380, 1: complete). Raffles Light (ANSP 245726, 3). Sentosa (KAS no #, 1). SW of Keppel Harbor, Palau Hantu (USNM 660824). SOUTH CHINA SEA: Macclesfield Bank (BMNH 92.9.30.159.160, 2). JAPAN: Honshu, Hachijo Isl. (ANSP 240168, 1). Okinawa, 1 km WNW of Onna Village (LACM 78-29, 1; LACM 79-75, 1). Okinawa, Onna Village, Horseshoe cliffs (USNM 838612, 1). Okinawa, 5 km ESE of Zampamisaki, Bolo Point (LACM 78-25, 1; LACM 78-100, 1). Okinawa, Serigaki Beach (DLG 44k, 6; AMNH 276888, 3). Okinawa, 1 km S of Kuwae Hospital (USNM 838483, 1). Okinawa, 1 km S of Kuwae Hospital near old Hamby Yacht Club (USNM 838483, 1). PHILIPPINES: Bohol (NMW, 1). Siquijot Isl., San Juan, San Juan Reef (USNM 802093, 1). Luzon, Batangas (CASIZ 081039, 1). Luzon, Batangas, Devil's Point (CASIZ, 1). Luzon, Batangas, Calatagan (DMNH 205368, 1). Luzon, Bataan Province (LACM 74724, 1). Palawan, San Pedro Cove, Linapacan Isl. (LACM 88-285.21, 1). Palawan, Calamian Group, Batunan Isl. (LACM 74701, 1). Mindanao, Zamboanga, Yellow Beach (KAS no #, 1). Mindanao, Silino Isl. (USNM 245500, 1). Mindoro, Aro Point (KAS no #, 1). Lubang (KAS no #, 1). Maricaibo, Devil Point (KAS no #, 1: complete). PALAU (= BELAU): Koror, Malakal Harbor (ANSP 203083, 1). Arakbesan Isl. (ANSP 204544, 2). INDONESIA: Java, Thousand Isl., Palau Pelangi (KAS no #, 1). Java, Pulau-Pulau Seribu Isl., off Jakarta Roya, Pelangi and Putri Isl. (LACM 86-163, 8). Schouten Isl., Biak Isl. (USNM 600559, 3). Sulawesi, off Menado, S Banuken and Siladen Isl. (LACM 88-56, 3: 1 complete). Bali (RP no #, 2). Bali, Lovina Beach, N coast (KAS no #, 6). Dual Tual (RP no #, 1). Lesser Sunda Isl., Komodo Isl., Station JEM 87-4 (CASIZ 081123, 1). Ambon, Nus Laut Isl. (DLG 44e, 1: specimen from Baer, 1994). MALAYSIA: Borneo, Sabah, Sipidan (KAS no #, 1). Borneo, Sabah, Sipidan, Sapi Isl. (KAS no #, 1: complete). NEW GUINEA: N coast near Madang, Pig Isl. (= Tab Isl.) (CASIZ 086544, 1). 2.5 km SW of Biak, Dock-Reef (ANSP 206392, 2: complete). New Btitain (RP, 1). New Brittain, Rabaul (RP no #, 3). NW Nusa Perida, Toya Pakeh (DLG 44h, 1; KAS no #, 1). WA: Roebuck Bay (AMNH 220132, 1). NE corner of Seringapatam Reef (DLG 44i, 1). Ashmore Reef (DLG 44f, 1; KAS no #, 1). Freemantle, Cochburn Sound, Woodman Point (ANSP 358590, 1). QLD.: Lizard Isl. (LACM 79-53, 1; LACM 79-55, 1). Capricorn Isl. (CASIZ 102571, 3). Swain's Reef (CASIZ 102570, 2). Middle Keppel Isl. (CASIZ 102572, 3). Great Keppel Isl. (KAS no #, 1). South Keppel Isl., off Yepoon (CASIZ 102936). Keppel Group, Conical Isl. (CASIZ 102937). Keppel Bay, Middle Isl. (KAS no #, 3). Keppel Bay, Keppel Isl. (SBMNH, 1; ANMH 220249, 2). Keppel Bay (SBMNH, 1). Keppel Bay, Pumpkin Isl. (KAS no #, 1). Humpy Isl. (KAS no #, 3). Gladstone (RP no #, 1). Moreton Bay (KAS no #, 1). Stanage Bay (KAS no #, 4; SBMNH, 1). Great Barrier Reef, Grub Reef (LACM 83-44, 1). NSW: Sydney, Botany Bay (SBMNH 209, 2). Lord Howe Isl., Neds Beach (AMS ex 328700, 1: complete). MARIANAS: W Saipan (DLG 44j, 3; KAS no #, 1). Guam (USNM 887465, 1; AMNH 220127, 2). Guam, Orote Cliffs (AMNH 220528, 1). Guam, Tweed's Cave (USNM 852034, 1). Guam, off Gun Beach, Tumon Bay (USNM 698004, 1). SOLOMON ISL.: NE side Vanganu Isl., Marovo Lagoon, Kokuana Passage, Matui Isl. (LACM 89-77, 1). Honiara (CASIZ, 1). Bunana Isl. (BMNH 2144, 2). NEW CALEDONIA: Central N side, Bogota Reefs (USNM 693386, 1). Grand Reef of Koumac (MNHN sta. 1316, 3; MNHN sta. 551, 1). Passe de Koumac (MNHN sta. 1310, 1). Sector of Belep (MNHN sta. 1217, 1; MNHN sta. 1128, 1). Touaourou (USNM 795269, 1). Cook's Reef (CASIZ 102574). Ile des Pins (KAS no #, 2). Ile des Pins, Kuto Beach (CASIZ 102494). Noumea, Ilot Charton, Baulati Bay (ANSP 275419, 1). Noumea, Baie de Citron (ANSP 237557, 1). Noumea, Baie Ouemo (DMNH 19675, 1; ANSP 271204, 1). Noumea, Touho, Koe Reef (DMNH 69885, 1). Noumea, Touho (ANSP 238033, 1). Sector of Touho (MNHN sta. 1264, 1; MNHN sta. 1271, 1). Bourail (AMNH 107198, 1). Ouen Isl., Prony Bay (MNHN sta. 232, 1). Sector of Yaté (MNHN sta. 735, 1). N. O. "Alis" Campagne SMIB 5, 23° 25' S 168° 05' E (MNHN sta. DW99, 1). FEDERATE STATES OF MICRONESIA: Upper Mortlocks, Losap Isl. (DMNH 205366, 1). Kapingamarangi Atoll (UCMP loc. # 13107, 1). Eniwetok Atoll (AMNH 92485, 1). Eniwetok, Rigili Isl. (USNM 580735, 1). Kwajalein (KAS no #, 1). Kwajalein, West Reef (DLG 44c, 2; KAS no #, 4). Kwajalein, Carlson Isl. (KAS no #, 3; KAS no #, 1). Rongerik, Bock Isl. (USNM 586290, 1). TONGA: Ha'apai Group, Cornfield and Campbell (CASIZ 102573, 1: complete). Vava'u Group, SW Vava'u Isl., S end Pangaimota Isl., cliff at W end of Maugaui (LACM 86-220, 1). Vava'u Group, N side Nuapupa Isl., outside of lagoon (LACM 85-89, 1). Vava'u Group, between Longitau Isl. and Vaka'eitu Isl. (LACM 85-90, 1). Eua Isl., Aa'a Luma Beach (KAS no #, 1). WESTERN SAMOA: Savaii Isl., Mataatu Harbor, Eastern Reef (AMNH 178945, 1). AMERICAN SAMOA: Fagan Bay (KAS no #, 2).

LITERATURE, LOCALITIES: Indonesia, Bali, Temukus Roads (Boone, 1938). QLD., Hayman Isl. (Anon., 1975). QLD., Michaelmas Cay; WA, NW Cape (Anon., 1982). Kepulauan Seribu (Stewart, 1986). WA, Ningaloo Marine Park (Wilson, 1993).

LITERATURE, RANGE: New Caledonia; tropical Australia; Hachijo-jima; Singapore (Talmadge, 1963). PNG (Hinton, 1972: as *crebrisculpta*). E coast (Hinton, 1978: as *crebrisculpta*). As far S as Keppel Bay, Guadalcanal, Japan (Anon., 1982). Japan through N Australia (Abbott & Dance, 1983). Lesser Sunda Isl. (Dharma, 1988: as *crebrisculpta*). New Caledonia (Salvat *et al.*, 1988: as *coccoradiata*). Scott Reef - N QLD (Wilson, 1993). Madagascar, New Guinea, Borneo, Philippines (Gosliner *et al.*, 1996). Madagascar, Rodriguez Isl., Chagos Archipelago, Maldives, Okinawa, Tonga (Stewart & Geiger, 1999).

Haliotis crebrisculpta Sowerby, 1914 (Figs. 24, 25, 28)

NEW CALEDONIA: (BMNH 1919.12.31.19, 1: lectotype).

Haliotis diversicolor Reeve, 1846 (Figs. 24, 40-42)

JAPAN: Honshu, Wakayama, Nada (MHNG 21818, 1). Honshu, Wakayama, near Seto Marine Laboratoty, Cape Bansho-zaki (LACM 82-19, > 50). Honshu, Wakayama,

Shirahama, Kii (AMNH 260667, 4; AMNH Edison A9853, 1). Honshu, Wakayama, Goza, Sime (ANSP 219612, 1). Honshu, Wakayama, Nada-cho, Kusui (AMNH 220246, 2; AMNH 241420, 5). Honshu, Awa and Shirahama, Kii coast (DMNH 049707, 3; AMNH 198684, 2). Honshu, Ishikawa, Noto Peninsula, Lighthouse at Akasaki (LACM 82-7, 1). Honshu, Ishikawa, Noto Peninsula, Monzen-fukami (LACM 82-5). Honshu, Niigota, Sado Isl., Aikawa Machi, Samuto Saki, Seki (ANSP 399942, 3). Honshu, Kanagawa, Sagami Bay (DMNH 010974, 2; AMNH 112368, 10). Honshu, Kanagawa, Sagami Bay, Akiya (LACM H-792, 2; ANSP 209152, 2). Honshu, Kanagawa, Sagami Bay, near Kanagawa (ANSP uncataloged, 4). Honshu, Kanagawa, Sagami, Hayama, near Kamakura (ANSP 86090, 14). Honshu, off Hondo, Sagami Bay, Misaki (USNM 206245, 2). Honshu, Kanagawa, Yokohama (USNM 43067a, 3). Honshu, Kanagawa, O-shima (AMNH 19699, 2; MHNG 13180, 1). 180 km S of Tokyo, Miyake Jima Isl. (AMNH 186262, 1). S of Tokyo Bay, Hachijo Isl. (AMNH 198677, 1; ANSP 252616, 5). Tokyo (MHNG 13168, 3). Honshu, Chiba, Station Boshu (LACM 120225, 1). Honshu, Akite, Fukura Awaji (ANSP 76329, 2). Honshu, Shizuoka, Toga (ANSP 252585, 4). Honshu, Mie (ANSP 252584, 10). Honshu, Mie, Ise (AMNH 80436, 2). Honshu, Mie, Anori (ANSP 252586, 6). Honshu, Mie, Toba (AMNH 220192, 1; DMNH 186156, 2). Honshu, Aishi, Mikawa (USNM 664049, 1). Nagai Reef (LACM 91229, 3; LACM 91274, 1). Shikoku, Ehime, Misaki (ANSP uncataloged, 1). Shikoku, Kochi, Tosa (LACM P.222.53, 2; AMNH 220247, 1). Shikoku, Kochi, Tosa (DMNH 008691, 4, DMNH 008705, 4). Kyushu, Iki Isl. (NHB 3835-b). Kyushu, Enoshima (DMNH 061282, 2). Kyushu, Kagoshima (ANSP uncataloged, 1; USNM 226854, 1). Kyushu, Kagoshima, Satsuma (ANSP 76324, 1). Kyushu, Nagasaki (NHB 5438-a, 3; USNM 226858, 5). Kyushu, Nagasaki, Hirado (AMNH 19686, 2). Kyushu, Nagasaki, Hirado Uzen (ANSP 80368, 8). Kyushu, Nagasaki, Hirado Hizen (ANSP 262740, 2; ANSP 49765, 4). Kyushu, Nagasaki, Matsushima Bay (ANSP uncataloged, 1). Kyushu, Nagasaki, Mogi (USNM 226860, 8). Okinawa (USNM 671030, 2). Okinawa, Awa (ANSP 119841, 15). KOREA: Cheju-do (= Quelpart Isl.) (LACM 71-256, 1). CHINA: (LACM 45940, 1; AMNH 220174, 1). Hong Kong (LACM 45957, 6; LACM 45831, 1). Hong Kong, Port Shelter, Dock Rocks (ANSP 222671, 2). Fokine, Santu (NHB 3835.a, 9). Fikine, Foochow (Fuchau) (DMNH 011038, 2). TAIWAN (= FORMOSA): (AMNH 164450, 1; AMNH 182979, 6). Taipei (USNM 708574, 8). PHILIPPINES: Mindoro (AMNH 220172, 1). Minodoro, Quadras (USNM 303330, 1). INDONESIA: Bali, Beach Hotel (ANSP 319655, 1). WA: E of Albany, near Point Valliant, Two Peoples Bay (LACM 87-96, 1). Exmouth Gulf, Exmouth (SBMNH 6185, 1). TONGA: Tongatapu Isl., N of Government Fisheries (LACM 81-56, 1). Ha'apai Group, Limu Isl. (LACM 72-153, 3).

LITERATURE, LOCALITIES: Yedo [= Tokyo] (Pilsbry, 1895).

LITERATURE, RANGE: N Hokkaido and S (KIRA, 1962: as *supertexta*). N Australia; Indonesia; Philippines; China; Ryukyu; Amami Isl.; Bonin Isl.; Kyushu Isl.; Shikoku Isl.; S Honshu - Boso Peninsula (Habe & Kosuge, 1964). Shirahama, Kii Peninsula and S (Habe, 1964). Shirahama, Kii Peninsula (Japan) and S (Lindner, 1975). Japan, Korea (Abbott & Dance, 1983: as *aquatilis*).

Haliotis dissona **(Iredale, 1929) (Figs. 24, 139, 140)**

MARIANAS: (MNHN no #, 2). FEDERATE STATES OF MICRONESIA: (AMNH no #, 1). NEW CALEDONIA: (AMNH 44374, 3; AMNH 44370, 1). Noumea (DMNH 116937, 1). Noumea, Baie Citron (BMNH 2341, 1). Passe de Koumac (MNHN sta. 1311, 2; MNHN sta. 1319, 2). VANUATU: (MNHN no #, 1). FIJI: (MHNG 13171, 1). S of Koro Levu Isl., Taveuni (USNM 695560, 1 [?]). Kandavu, E of Yauravu Pass (USNM 696660, 1). Viti Levu, Suva Main Reef, Rat Tail Passage (USNM 835591, 1: complete). Astrolabe Reeve (JK no #, 1; JK no #, 6 with dried bodies). TONGA: Tongatapu, Sopu (USNM 672192, 2). Tongatapu Isl., N of Government Fisheries (LACM 81-56, 1; BMNH no #, 2). Ha'apai Group, Limu Isl. (LACM 72-153, 3).

LITERATURE, LOCALITIES: Michaelmas Cay (Iredale, 1929: type locality).

Haliotis dohrniana **Dunker, 1863 (Figs. 24, 120, 123)**

INDONESIA: Java, Jakarta Raya, Pulau-Pulau Seribu Isl., Pelangi and Putry Isl. (LACM 46-162, 1: complete). PHILIPPINES: Taui Taui, Tataam Isl. (USNM 245559a, 1). MARSHALL ISL.: Jaluit Isl., Jabor Isl. (SBMNH 24051, 1). SOLOMON ISL.: Santa Cruz, Pigeon Isl. (SBMNH 1217, 1). QLD.: Wreck Bay, Martha Ridgway Reef (DMNH 31783, 1). NEW CALEDONIA: Noumea, Amadee Lighthouse (DMNH 116937, 1). Passe Koumac (MNHN sta. 1323, 2 [?]). Unia near Yate (USNM 795141, 1 [?]). VANUATU: Efate (AMNH 221448, 2). SW Efate (USNM 793717, 1: complete). Efate, Point d'Arbel (USNM 787480, 1: complete; USNM 787378, 1). SE coast of Santos Isl. (USNM 787248, 1; USNM 787211, 2). Reef S of Utja, Aneityum (= Anatom) (USNM 692098, 2). Reef near Tjipthav, Aneityum (= Anatom) (USNM 692374, 6). N Port Aneityum, Aneityum (= Anatom) (USNM 692069, 2). TONGA: Tongatapu, Nuku'alofa (SBMNH no #, 5).

LITERATURE, LOCALITIES: Dutch East Indies; Formosa (= Taiwan) (Talmadge, 1963). Kepulauan Seribu; Bali (Stewart, 1986).

LITERATURE, RANGE: New Caledonia (Abbott & Dance, 1983).

Haliotis fatui **Geiger, 1999 (Figs. 43, 116, 117)**

MARIANAS: Mang Island, N Marianas (USNM 486708, 1: holotype). Agrigan Island, (USNM 487953, 1: paratype). NEW BRITAIN: Kumbun Island (ANSP 284325, 1: paratype). SOLOMONS: Santa Ana Island (AMNH 81878, 1: paratype; AMNH 81899, 1: paratype). VANUATU: (MHNG 21226, 1: paratype). TONGA: (USNM no #, 1 paratype). NE side of Tofua Island, Ha'apai Group (USNM 702975, 7: paratypes). Reef off Tofua Island (USNM 702512, 9: paratypes). Vavau (USNM no # [ex. San Diego Society of Natural History No. 32719], 2: paratypes).

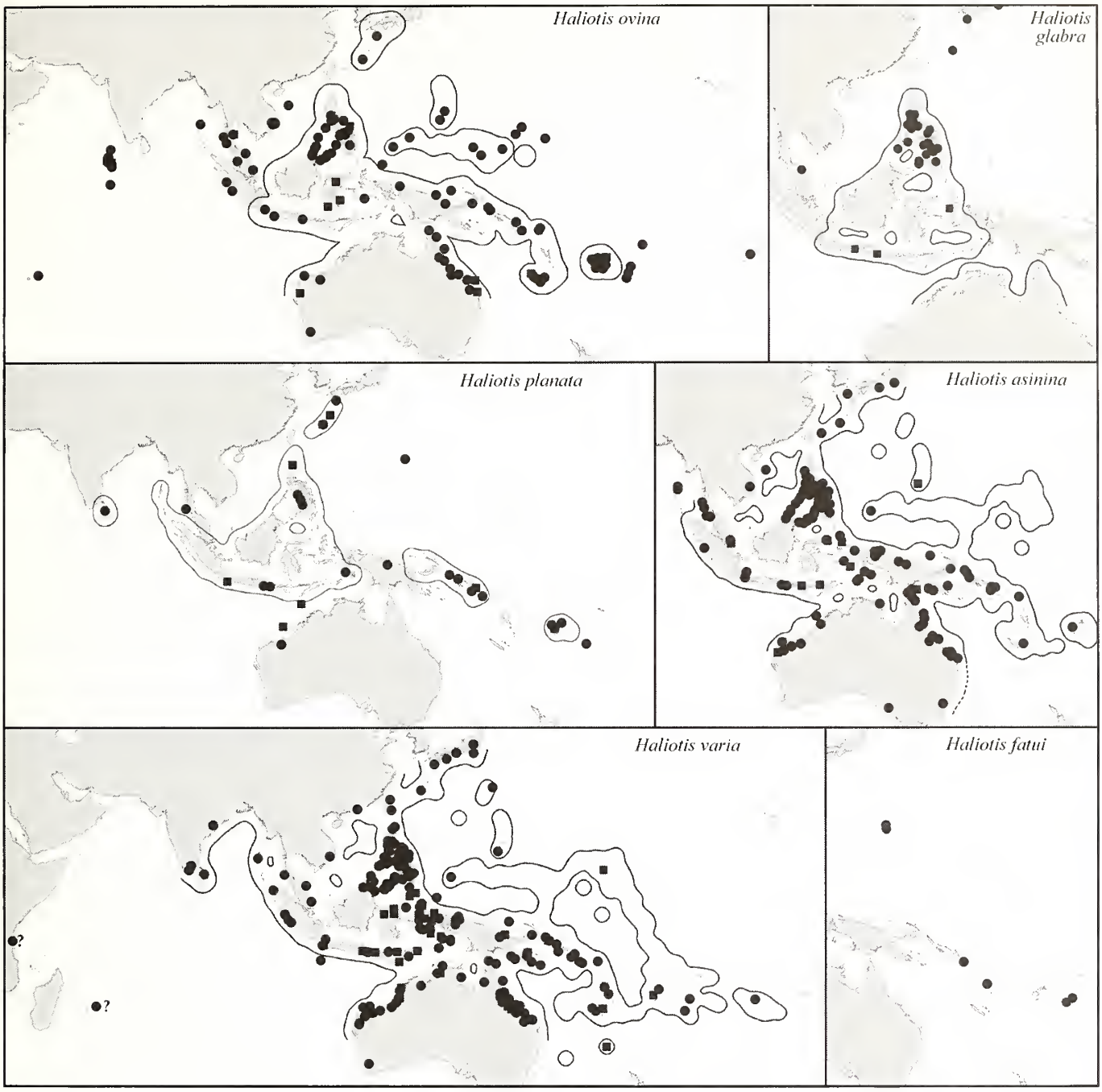


Fig. 43 - Distribution of Indo-Pacific species of *Haliotis* spp. *(II)*. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

Haliotis glabra **Gmelin, 1791 (Figs. 26, 27, 29, 30, 43)**

JAPAN: Honshu, Wakayama, Kushinoto (DLG AAB 19b, 10; DLG AAB 19c, 4). Honshu, Wakayama, Awa and Shirahama, Kii coasts (AMNH 220173, 1). Kyushu, Kagoshima (DMNH 186155, 1). PHILIPPINES: Luzon, Bataan (DMNH 181156, 1). Luzon, Bataan, Cabcaben (DMNH 002732, 6). Luzon, Bataan, Corregidor Isl. (LACM 74727, 2; ANSP 95395, 1). Luzon, Bataan, W tip of Corregidor Isl. (ANSP 230117, 2). Luzon, Bataan, Luson (LACM 152164, 1). Luzon, Bataan, Lusang (ANSP 246218, 2). Luzon, Bataan, Maviveles (ANSP 230399, 4; USNM 283263, 1). Luzon, Bataan, E end of Sisiman Bay (ANSP 230038, 9). Luzon, SE Bataan, at Cabcaben (ANSP 229787, 29). Luzon, SW Battan, Lusong Cove (ANSP 230060, 1). Luzon, Bantangas, Maricaiban Isl. (USNM 245502, 21). Luzon, Bantangas, E of Maricaban Isl., between Culebra Isl. and Malajibomanoc Isl. (LACM 84-162, 1). Luzon, Batangas, Pagaspas Bay (LACM 74729, 2). Luzon, Zambales, Iba (DMNH 002763, 7; ANSP 229243, 14). Luzon, Manila Bay, Cavite (DMNH 122844, 2; DMNH 003203, 5). Luzon, Manila Bay, Caballo Isl. (ANSP 229670, 1). Luzon, Quezon, Baler (AMNH 103697, 1). Luzon, Sorsogon, Sorsogon (LACM 74728, 2). Luzon, SE Sorsogon, Magallanes

(DMNH 002447, 2; LACM A.1930, 4). Luzon, Tayabas Province, Dingalan Bay, N Otpegon Point (SBMNH 12242, 1). Marinduque (DMNH 187194, 1). Marinduque, Quadras, Laylay, Baie de Boac (USNM 306, 1). Mindoro (DMNH 010979, 3; LACM S.1116, 3). Mindoro, Calapan (DMNH 049711, 9; DMNH 049411, 17). Mindoro, Calapan, Hoecapilato Isl. (ANSP 249511, 14; ANSP 242232, 4). Mindoro, Calapan, Nazareto, Silonay Isl. (BMNH 1962891, 5; SBMNH 04884, 8). Mindoro, Lubang (LACM A.2777a, 4). Mindoro, Silonay Isl. (NHB 1716b, 5). Mindoro, Silonay Isl., Nazareto Calapan (USNM 656741, 7). Negros (DMNH 010981, 1). Bohol (DMNH 186029, 3). Bohol, Jagna (DMNH 186157, 8). Mindanao, Surigao del Sur, Marihatag (DMNH 176017, 1). Mindanao, Davao (DMNH 187932, 1). Mindanao, Zamboanga (AMNH 220187, 4; USNM 310209, 6). Mindanao, San Ramon Farm, near Zamboanga (USNM 245531, 2). Mindanao, near Zamboanga, Ayala (USNM 245561, 35). Mindanao, Dapitan (USNM 303634, 1). N of Mindanao, Camiguin Isl., Mambajas (ANSP 223742, 5). Cebu (BMNH 2341, 4). SE Masbate, off Talajit Isl. (USNM 234209, 1). Dalanganem Isl. (USNM 245494, 9). Palawan (MHNG 21235, 1).

LITERATURE, LOCALITIES: Molluccas, Bachan (Oostingh, 1925). Bali, beach between Boegboeg and Boeitan (Adam & Leloup, 1938). Java (Dauphin & Denis, 1995).

LITERATURE, RANGE: N Australia; Indonesia; Philippines; Reunion Isl. (Habe & Kosuge, 1964). Philippines (TALMADGE, 1963; Springsteen & Leobrera, 1986). Philippines - N Australia (Abbott & Dance, 1983). Moluccas and Lesser Sunda Isl. (Dharma, 1988).

Haliotis jacnensis **Reeve, 1846 (Figs. 24, 124-129)**

INDONESIA: Java, Jakarta, near Thousand Isl. (DLG no #, 1). JAPAN: (LACM 91304, 2). Honshu, Wakayama, Shirahama, Kii (AMNH 276887, 1; AMNH 279268, 1). Shikoku, Kochi, Tosa Bay (LACM 22230, 2). Loochoo (= Ryukyu) (LACM 91219, 2; ANSP 252455, 6). Okinawa, off Sunabea wall, 4 km SSW of Kadena Circle (LACM 78-28, 1). Okinawa (LACM S.4628, 1; LACM 45886, 1). Okinawa, ESE Zampa-misaki, Bolo Point (LACM 78-25, 1). Okinawa Gunto, Kerama Retto, SW side of Gishifu Shima (LACM 77-72, 1). Okinawa, Madimoto (AMNH ex 187058, 1). Okinawa, Imbu (SBMNH no #, 1). PHILIPPIES: N Samar (DLG AAB 45c, 2; DLG AAB 45e, 15). MARIANAS: Saipan (DMNH 009712, 3; DMNH 115477, 3). Guam (SBMNH 26856, 1). Guam, Tweed's Cave dive area (USNM 852057, 1; USNM 851181, 1). FEDERATION OF MICRONESIA: Upper Mortlocks Losaap Isl. (DMNH 205367, 8). MARSHALL ISL.: Eniwetok Atoll (AMNH 182982, 2; SBMNH no #, 2). Eniwetok Atoll, Aniyaanii Isl. (LACM 114416, 1: with dried body). Eniwetok Atoll, between Parry and Eniwetok Isl. (LACM 113210, 2: with dried bodies). Enewetok (Fred), lagoon (SBMNH no #, 1). Eniwetok, Ragoa and Buiri Isl. (USNM 655738, 1). Eniwetok, Rigili Isl. (USNM 581238, 1; USNM 607247, 1). Bikini, Namu Isl. (USNM 580699, 6; USNM 580124, 3). Bikini, Bikini Isl. (USNM 579750, 1; USNM 579387, 1). Bikini, Okini Isl. (USNM 579207, 3). Bikini, Yomyaran Isl. (USNM 580299, 1). Bikini, Enyu Isl. (USNM 580961, 1). Rongelap, Kobelle/Kabelle Isl. (USNM 585759, 1; USNM 582105, 33). Rongelap, Kieskiechi Isl. (USNM 585415, 2). Rongelap, Erapwotan (USNM 584113, 3). Rongelap (USNM 610131, 1). Rongelap, Burok Isl. (USNM 585859, 2: complete). Rongerik, Latobach Isl. (USNM 582952, 1). Rongerik, Enyvertik (USNM 583456, 1: complete). Taka Atoll (USNM 615515, 4). Ailuk Atoll, Ailuk Isl. (USNM 615154, 3; USNM 615155, 1). Ujelang Atoll (USNM 614614, 1). Wotho Atoll, Wotho Isl. (USNM 614442, 1; USNM 614437, 4). Ujae Atoll, Wotya Isl. (USNM 607363, 6). Ujae Atoll (USNM 614535, 3; SBMNH no # 6). Lae Atoll (USNM 615020, 2; USNM 615030, 2). Lae Atoll, Lae Isl. (USNM 614914, 12). Majuro Atoll, Laura (SBMNH 6131, 1). Kwajalein Atoll (USNM 486159, 2). S Burok Isl. (USNM 585859, 1: complete). KIRIBATI: Gilbert Isl., Onotoa Atoll (USNM 622624, 1). PNG: New Britain (RP no #, 1). NEW CALEDONIA: (LACM 45882, 4; MNHN no #, 2). Noumea, Baie Ouemo, near radio station (ANSP 399938, 1). Grand Reef of Koumac (MNHN no #, 1; MNHN sta. 1323, 2). Loyality Isl., Lifou (USNM 423136, 2). TONGA: Nive (= Niue) (USNM 360742, 1; SBMNH no #, 4). Tongatapu Group, 3.5 km of S-most tip Eua Isl., Ha'a Luma (LACM 81-55, 6; AMNH 222563, 3). Eua Isl. (BMNH no #, 2). Eua Isl., Aa'A Luma beach (USNM 851407, 3; SBMNH 6169, 4). FIJI: Astrolabe Reef, site 121 (JK no #, 1). ILES WALLIS: Futuna, W Anse de Sigave (USNM 676583, 1).

LITERATURE, LOCALITIES: New Caledonia, Ile Nou; Philippines, Bohol, Jacna; Okinawa; Cebu; Guam; Palau; Truk; Ponape; Eniwetok; Bikini; Rongelap; Kwajalein; Suva; New Caledonia, Lifu; New Hebrides (= Vanuatu), Espiritu Santo; Rabaul (Talmadge, 1963).

LITERATURE, RANGE: Ryukyu; Philippines; Maraina Isl.; Carolines; Marshall Isl.; Fiji; Loyality Isl.; New Hebrides; Bismarck Archipelago (Talmadge, 1963). Amami Isl. and S (Habe, 1964). Philippines; Ryukyu Isl.; Amami Isl. (Habe & Kosuge, 1964). Philippines (Abbott & Dance, 1983).

Haliotis ovina **Gmelin, 1791 (Figs. 31-33, 43)**

MAURITIUS: (DMNH 010990, 3; NMBE Schuttleworth.401, 1). Balaclava (MNHN no #, 1). MALDIVES: Addu Atoll, Feddu lagoon (BMNH, 6: complete). Addu Atoll, seaward reef (BMNH no #, 1). Addu Atoll, W of S tip of Wilingilis (ANSP 305183, 1). N Male Atoll, N of Male, Dunidu Isl. (ANSP 305219, 1). SE side of N Male Atoll, Imma Isl. (ANSP 305562, 1). N Male Atoll, N Kagilsland (ANSP 303991, 2). N Malosmadulu Atoll, N and NW of Ongu Isl. (ANSP 304430, 1). Rasdu Atoll (ANSP 399939, 2). Tiladummati Atoll, NW of Filadu Isl., Faro Islet (ANSP 304839, 1). Helengili (DLG AAB 26a, 1). ANDAMANES: (BMNH no #, 1). THAILAND: Phuket (DLG 26h, 1). Phuket, SW end of Bon Isl. (LACM 85-3, 1). Off Phuket, E Mai Thon Isl. (LACM 85-8, 2). Phuket, E Kaew Yai Isl. (LACM 85-5, 12: 1 with dried body). Phuket, SW Bon Isl. (LACM 85-3, 1 body, 1: complete). Gulf of Siam, Ko Tao (USNM 405685, 2). Te Vega, Goh Sindarar Nua (= Chance Isl.) (USNM 661337, 1).

MALAYSIA: Peninsula, Perhentian Isl. (BMNH 2264, 1). Pulau Pangkor (BMNH 2264, 1). N Borneo, Kudat, Airport Trench (ANSP 262759, 1: subfossil). N Borneo, Tigabi Isl., Malawali channel (USNM 666858, 1). N Borneo, Semporna, Bahaydulong Isl. (USNM 666729, 1). Off Mersing Coast, Pulau Babi Besar (ANSP 399937, 1). Borneo, Sabah, Jesselton (NMW). N Borneo, Maliangin Isl. (ANSP 298206, 1). New Guinea, New Britain, 5 miles from Rabaul, Matapit Isl. (ANSP 304687, 1). New Guinea, Manus Isl., Pere village (AMNH 215141, 1). INDONESIA: Java, Pangandaran (DLG 26j, 3). Java, off Jakarta, Raya, Pulau-Pulau Seribu Isl., Pelangi and Putri Isl. (LACM 86-162, 1 + 1 complete; LACM 86-163, 1). Java, Batavia/Jakarta (MNHN no #, 1). Java, Jakarta Bay, Thousand Isl. (DLG no #, 10). Ambon (NMBE Schuttleworth #402, 2). Bali, Lovina Beach (DLG 26c, 1). Irian Jaya, Biak, near KLM Resthouse, 1 mile E of Dock (ANSP 206482, 2). Schouten Isl., Biak (USNM 600567, 1). Sumatra, N of Sipora, Pulau Siburu (USNM 654703, 2). Te Vega, Pulau Bai, Batu Group, off Sumatra (USNM 654480, 1: complete). VIETNAM: Nha Trang (MNHN no #, 1; SBMNH 03515, 1). Nha Trnag, Hon Leo Isl. (DLG 26m, 6; LACM 69-111, 1). South China Sea in vicinity of Nha Trang (LACM 109718, 2). Cam Ranh Ba, Gran Passo Die (AMNH 198787, 1). Vanfong Bay, Hon Lon (LACM 67-187, 1). Paracels (MNHN no #, 3). JAPAN: Okinawa (LACM A.8589, 1; LACM AHF Acc. 1063, 2). NE Okinawa (ANSP 325440, 1). Okinawa, Ukibaru Shima (DMNH 120273, 3). Okinawa, Bolo Point (AMNH Jackson 1992 A9873, 32; AMNH Jackson 1992 A9873, 3). Okinawa, off Sunabe sea wall, 4 km SSW of Kadena Circle (LACM 78-28, 2). Okinawa, WNW of Onna Village (LACM 78-27, 1). Okinawa, Onna Village, Horseshoe Cliffs (USNM 828892, 1). Okinawa, Kadena Yacht Club, Channel (USNM 821388, 1; USNM 821127, 1). Okinawa, Yakata, Katabaru, Onna Village (USNM 809879, 1). Okinawa, Ada (SBMNH no #, 1). Okinawa, Sobe Point (SBMNH 2766, 1). Okinawa, NNW Oku (LACM 77-61, 1). Okinawa, 1.5 miles S of Henna (ANSP 302731, 1). Okinawa, Nakama, Catholic Camp (AMNH 248812, 1). Okinawa, Serigaki Beach (AMNH 276892, 2). Okinawa, Shioya (USNM 600811, 3). Okinawa, Shioya, Shanawan Bay (USNM 489109, 1). Okinawa, off Ogimi (USNM 488118, 1). Okinawa, Chinen reef flat (SBMNH no #, 5). Okinawa, Henza reef (SBMNH no #, 2). Okinawa, Tsuke reef flat (SBMNH no #, 1). Kyushu, Osumi, Osima (USNM 343830, 5; USNM 273338, 3). PHILIPPINES: Luzon, Bataan (DMNH 181157, 2). Luzon, Sorsogon, Magallanes (ANSP 223931, 1). Luzon, SW Corregidor Isl. (USNM 235293, 1). Luzon, 13° 43' 59" N 120° 49' 11" E (USNM 801679, 1: complete). Minodro, Calapan (DMNH 049717, 3). Mindoro, Puerto Galera (LACM 74730, 1; LACM 74732, 1). Mindoro, Dalaovan (LACM 74737, 1). Bohol, Panglao (DLG 26d, 6). Cebu Isl., Cebu City (SBMNH 3502, 1). Leyte (DMNH 194171, 1). Sulu Archipelago, Sanga Sanga Isl. (DMNH 049193, 1). Sulu Archipelago, Bet Siai & Bongao Isl. (USNM 313983, 1). Sulu Archipelago, Tawi Tawi Group, Tataan Isl. (USNM 245559, 1). Sulu Archipelago, Jolo, Bubuau Isl. (USNM 245548, 2). Sulu Archipelago, Jolo, Marongasi Isl. (USNM 245535, 3; USNM 245546, 1). Sulu Archipelago, Dammai Isl. (USNM 24556, 3). Sulu Sea (LACM HH-3740, 1). Mindanao (LACM 45791, 1). Mindanao, Zamboanga province, Zamboanga Bay (LACM 74731, 1). Palawan, Linapacan Isl., San Pedro Cove (LACM 88-285.16, 1). Quezon, Polillo Group, Palasan (LACM 74734, 1). Quezon, Baler (AMNH 132075, 1). Marinduque, Boac (AMNH 132109, 1). S Negros Oriental, Siaton, Tambobo (USNM 808480, 1). Negros Isl., Maloh (S tip of Isl.) (USNM 821756, 1). Negros Oriental, Guihulhga (SBMNH 28938, 1). MARIANAS: Near Guam (AMNH Edison A9853, 2). Guam (MNHN no #, 1). W Saipan, Lagoon (USNM 595505, 1). PALAU (= BELAU): (AMNH 220206, 1). Koror Isl. (DMNH 046176, 2). Near Ngatpeal Pass (DMNH 069889, 3). Babelthuap (AMNH 121795, 1; USNM 62093, 3). E Babelthuap, Reef 1 mile S of Namelakl Pass (ANSP 203153, 8). Babelthuap, 1 mile S of W Passage , 07° 33' N 134° 29' E (ANSP 200987, 2). Koror Isl., Near Koror (ANSP 202455, 2). Korukigiiri Isl., Malakal Harbour (ANSP 202046, 1). FEDERATE STATES OF MICRONESIA: Truk (LACM C-133, 2). Truk, Out of Moen, Paradise Reef (SBMNH 3037, 1). Yap Isl. (LACM 91228, 1; ANSP 250072, 2). Upper Mortlocks, Losaap Isl. (DMNH 037623, 3). Ponape (AMNH 284463, 1; AMNH 284465). Pohnpei (SBMNH no #, 1; SBMNH no #, 1). Pohnpei, Green Reef, Jokaj Passage (SBMNH no #. 1). Round Rock, Helen Channel, Helen Reef (ANSP 208680, 1). MARSHALL ISL.: Kwajalein Atoll (SBMNH 6135, 1). Eniwetok, Jeiteiripucchi Isl. (USNM 581709, 1; USNM 584690, 1). Enewetok, Enewetok (SBMNH no #, 1). Eniwetok, Rigili Isl. (USNM 581274, 10; USNM 581595, 1: complete). Eniwetok, Bokonarappu Isl. (USNM 655777, 3). Eniwetok, Rujoru Isl. (USNM 581515, 9). Eniwetok, Rajoa Isl. (USNM 655723, 1). Eniwetok, Jiriinien Isl. (USNM 581672, 2). Eniwetok, Mui Isl. (USNM 581624, 1). Enewetok Atoll, Bubble Butt Pinnacle (USNM 809786, 1). Ujalang Atoll (USNM 614617, 2). WA: Port Headland (DLG 26k, 2). Perth (LACM 45896, 1). QLD.: SE Lizard Isl. (LACM 79-55, 1). Whitsunday Group, Hook Isl. (DMNH 114349, 2). W GBR, Hawk Reef, E of Whitsunday Passage (AMNH 104761, 1). Hyman Isl. (AMNH 187150, 2). GBR, Cairns, Scott Reef (AMNH 178750, 1). Curtis Isl. (AMNH 80424, 2). GBR, off Townsville, John Brewer Reef (BMNH 2341, 1). Friday Isl., Tonoabatu (BMNH). Wreck Bay, Martha Ridgway Reef (DMNH 031805, 1). GBR, Hardy Reef (AMNH 104585, 3; AMNH 249919, 3). GBR, Beaver Isl., Beaver Reef, Hinchinbrook (ANSP 399930, 1). Capricorn Group, Tryon Isl. (USNM 617150, 1). Port Douglas (SBMNH 202, 1). PNG: Madang, Madang Channel (SBMNH 2594, 2). SOLOMON ISL.: Malaita (DMNH 050876, 1). Malaita, Roncador Reef (LACM 78-55. 25, 1). Bougainville (ANSP 327759, 1). Bougainville, Buin (LACM 45788, 1). Santa Ana Isl. (AMNH 81900, 1). Reef Group, Ngakando Isl. (SBMNH 2704, 1). Santa Cruz Group, Pigeon Isl. (SBMNH 1216, 6). NEW CALEDONIA: (AMNH Edison A9853, 2). Bourail (AMNH 107201, 3). Bourail, 2 miles NW of Pass (ANSP 269963, 3). Bourail, Plage de Poe (ANSP 237088, 2). Touho Bay (DMNH 069890, 1; ANSP 238028, 3). Ile Ain 3 miles ENE of Touho

NW (ANSP 270255, 1). Voh, Barrier Reef (DMNH 069891, 1). Gatope Isl., 5 miles WSW of Voh, SW (ANSP 269724, 2). Noumea (USNM 796586, 1: complete). Noumea, Amadee Light House (DMNH 116991, 1 + 1 complete). Noumea, E end of Vata Bay (ANSP 275417, 1). Dumbea Pass, 1.5 miles NNW of off Noumea (ANSP 270454, 2). Iles aux Goelands, about 7 miles SE of Dumbea Pass off Noumea (ANSP 270532, 1). Grand Reef of Koumac (MNHN sta. 1316, 2; MNHN 1319, 3). Yate (ANSP 238321, 1). La Foa (DLG 26i, 2). Brony (DLG 26l, 7). Port Koué (MNHN no #, 2). Loyality Isl., Relais de We (DMNH 116516, 1). Loyality Isl., Lifou, Relais de We, Bay Chateaubriand (DMNH 116453, 2 + 1 complete). Loyality Isl., Uvaa Atoll, Guetie Isl. (USNM 692693, 1). FIJI: (AMNH 220205, 3). Yanu-yanu (= I-loma Isl.), Astrolabe Reef (LACM 71-205, 1; LACM 71-203, 1). Vanua Levu (DMNH 010989, 1). W Vanua Levu, Rambi Isl., Georgia Cove (USNM 695337, 1). Vanua Levu, NW Rambi Isl., Albert Cove (USNM 695312, 1: complete). Vanua Levu, NE Yandua Isl. (USNM 694701, 1). Viti Levu (LACM 45912, 2; LACM 67-93). Viti Levu, Waya Isl. (DLG 26o, 1). Viti Levu, Korolevu (LACM 79-42, 1). Viti Levu, Nanu-i-Ra (USNM 638512, 1). Viti Levu, Suva Harbor (USNM 532329, 3; USNM 532378, 3). Viti Levu, St. Annes-on-Sea, Nadroga (USNM 835597, 2). Off Viti Levu, Malolo Group, Castaway Isl. (SBMNH 6132, 2). Yasawa Group, Nacula Isl. (LACM 81-38, 1). Koro, Smoothwater Reefs (USNM 695816, 1). Koro, Reefs W of Stoneaxe Road (USNM 695749, 2). Koro, SW of Tulane Harbour (USNM 695910, 1). Taveuni (USNM 695744, 1). Taveuni, N of Vuna Point (USNM 695685, 1). Tavauni, W of Koro Levu Isl. (USNM 695606, 2). Kandavu, E of One Isl. (USNM 696061, 1). Kandavu, S of Nagaloa Pass (USNM 696454, 1). Kandavu, S of Waya Isl. (USNM 696335, 1). Kandavu, NW of Solondamu, W Coast (USNM 69710, 1). Kandavu, Reef E of Yauravu Pass (USNM 696487, 1). Kandavu, NE side of Nagaloa Pass (USNM 696422, 2). Kandavu, E of Korelevu Bay (USNM 696138, 2). Matuku, off SW Point (USNM 686411, 1). Vambina (=Vambia) (ANSP 193214, 2). TONGA: Ha'apai group, Luangahu Isl. (LACM 72-151, 1). Vava'u Goup, Vava'u Isl., Kapa Isl., W Luaofa Isl. (LACM 86-231, 1). Vava'u Goup, Vava'u Isl., Kapa Isl., W Sisia Isl. (LACM 86-225, 1). Tongatapu Isl. (AMNH 249110, 1; ANSP 305800, 2). Tongatapu Isl., Sopee Reef (AMNH 240645, 1). Tongatapu, N Makaha'a Isl., Nuku'alofa Bay (AMNH 220204, 2). SAMOA: Navigators Isl. (= Samoa) (ANSP 50233, 1; USNM 89084, 2). Tutuila Isl. (USNM 488747, 1). TUAMOTUS: Makatea Isl. (DMNH 072530, 7).

LITERATURE, LOCALITIES: Tongatabu, Nukualofa; Monu Reef (Ostergaard, 1935). Lady Elliot Isl. (Cotton, 1943). Swain's Reef (Talmadge, 1961). Samar; Cebu; Schouten Isl.; New Caledonia, Cook's Reef (Talmadge, 1963). Gulf of Siam; Quobba, WA (Talmadge, 1974). Bali, Sanur (Baer & Caillez, 1985). Fiji, Matagi Isl. (Baer, 1986). Maldives, Male, Kurumba; Maldives, Rasdu, Kuramathi (Baer, 1989). Barrow Isl. (Wilson, 1993). Sulawesi, Toigna Isl.; Bira; Pulau Hari (Anon., 1995).

LITERATURE, RANGE: QLD - NW Australia (Allen, 1959). SW isl. of Japan (Kira, 1962). Ryukyu Isl.; Philippines; Dutch New Guinea; Solomon Isl.; New Caledonia; Loyality Isl.; Fiji; Indonesia; Carolines; Marianas (Talmadge, 1963). Kyushu Isl.; Shikoku Isl.; S Honshu - Kii Peninsula; Indian Ocean (Habe & Kosuge, 1964). PNG (Hinton, 1972). S Japan through N Australia (Abbott & Dance, 1983). WA, Point Quobba - QLD (Wells & Bryce, 1985). Philippines (Springsteen & Leobrera, 1986). Indonesia (Dharma, 1988). New Caledonia (Salvat *et al.*, 1988). Indo-West Pacific; WA, Carnarvon - Capricorn and Bunker Group (Wilson, 1993).

Haliotis planata Sowerby, 1882 (Figs. 43, 119, 122)

SRI LANKA: (ANSP 50192, 3; USNM 89090, 1). THAILAND: Phuket, Patang (DLG AAB 31a, 1). S Phuket, Ko Racha Noi (DLG AAB 31 b, 5). INDONESIA: Bali, Nusa Dua (LACM 86-164, 1 + 1 complete). W Lombok, N of Sengiggi Beach, Santigi Point (LACM 88-65, 1). New Guinea, Seleo Isl., NW of reef, Aitape (USNM 616058, 1). Kai Isl., Tajundu Isl. (= Tayandu Isl.), E Ree Isl. (USNM ex 746732, 1: complete). JAPAN: Kyushu, Kagoshima, Kikai, Osumi (DMNH 186025, 1; ANSP 86239, 2). Okinawa, 1 km NNW Oku (LACM 77-61, 1). Okinawa, Bolo Point Reef (LACM 27416, 2). Okinawa, Imbu Reef (AMNH 141006, 2). Okinawa, Imbu Bay (AMNH 163495, 1). Okinawa, Tancha Reef (SBMNH no # 1). Okinawa, Tsuken reef (SBMNH no #, 4). Okinawa, Onna reef (SBMNH no #, 2). PHILIPPINES: (NMW, 2). Panay (USNM 256594, 1). E end of Negros Isl., Admirality Isl. (USNM 488924, 1). Apo Isl. (USNM 828711, 1: complete). MARIANAS: Agrigan Isl. (USNM 487952, 4). WA: Port Headland (LACM 45846, 3 [?]; LACM 45790, 1 [?]). SOLOMON ISL.: Bougainville (LACM 45845, 1). Santa Ana Isl. (AMNH 81889, 1). Choiseul, Choiseul Bay (AMNH 81888, 1). Guadalcanal (NMW, 1). FIJI: (DMNH 130282, 1; AMNH 132598, 1). Viti Levu Isl. (LACM 67-93, 4; ANSP 50190, 1). Viti Levu Isl., Suva (LACM 72-147, 2). Viti Levu Isl., Mbengga Isl., Vanga Bay (LACM 71-202, 1). Viti Levu, Makuluva (USNM 531869, 1). Yasawa Isl. (USNM 617856, 1). Vanua Levu, W of Ngaratoka Pass (USNM 695049, 1). TONGA: Nuku'alofa district, Makaha'a Motu (LACM 72-150, 1). Tongatapu (BMNH no #, 2).

LITERATURE, LOCALITIES: Okinawa; N Coast of Luzon; Malaita; Fiji, Suva; S Java, Wynkoops Bay (= Pelabuhanratu, Teluk) (Talmadge, 1963). Kagoshima, Amami Isl. (Arai *et al.*, 1988).

LITERATURE, RANGE: From Yakushima S (Habe, 1964). Ryukyu Isl.; Philippines, Solomon Isl.; Fiji; Indonesia (Talmadge, 1963). Andamanes, Ceylon (Talmadge, 1974). Philippines (Springsteen & Leobrera, 1986). Indonesia (Dharma, 1988). Indian Ocean, Rowley Shoals, Cartier Isl. (NT) (Wilson, 1993).

Haliotis pulcherrima Gmelin, 1791 (Figs. 38, 39, 44)

KIRIBATI (= MARQUESAS ISL): Fanning Isl. (= Tabuaeran) (ANSP 185728, 1). Lord Hood Isl. (= Fatu Huku) (ANSP 199729, 2; AMNH 19781, 11). TUAMOTUS: Makatea Isl. (ANSP 199337, 12). W Makatea Isl. (DMNH 072616, 1).

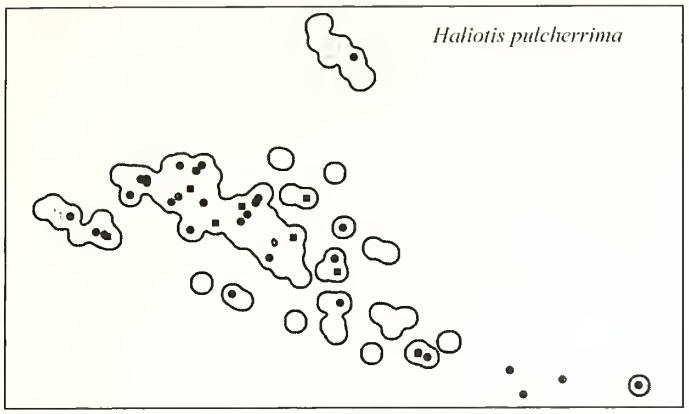


Fig. 44 - Distribution of the central Pacific (Tuamotus) *Haliotis pulcherrima* Gmelin, 1791. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

Rangiroa Atoll, Kai Ora Hotel (DMNH 115875, 2). Rangiroa, Ocean Side of Avatoru (LACM 96-10, 2). Rangiroa, Ayatoru Pass (USNM 782744, 1). Anaa (USNM 775845, 16). Anaa, Takapoto, Niau Atoll (DLG AAB 34a, 4). Takapoto Atoll (DMNH 186717, 3; MNHN no #, 10). Takapotu Isl. (LACM 117636, 1). Takaroa Atoll (DMNH 129590, 3; USNM 617399, 2). Takaroa Isl. (ANSP 185003, 10; ANSP 199320, 56). Marutea Atoll (DMNH 130747, 1). Nig[e]ri (= Nihiru) (LACM 59325, 7). Mahini (DMNH 156569, 1; AMNH 263365, 1). Mahini, King George Isl. (SBMNH 6187, 1). Manihi, E end of Main Motu (USNM 798134, 1). Raroia Isl. (ANSP 199095, 9; ANSP 250551, 2). Raroia Isl., Ngrumaea Isl. (USNM 698332, 2; 698529, 2). Raroia Isl., Kahongi Isl. (USNM 698576, 2). Raroia Isl., Oneroa Isl. (USNM 720725, 2). Raroia Isl., S Opakea Isl. (USNM 722376, 1; USNM 723121, 1). Raroia Isl., Matira Isl. (USNM 698609, 16). Raroia Isl., Garumaoa Isl. (USNM 722122, 7). Raroia Isl., N Garumaoa Isl. (USNM 720196, 2; USNM 723462, 24). Raroia Isl., Gavarivari Isl. (USNM 723276, 1). Raroia, Tekatikati Isl. (USNM 721286, 1). Vahitahi (AMNH 107583, 5; USNM 613279, 15). Toau Atoll, Marangnia islet (ANSP 155933, 6). Toau Atoll, Ocean Beach (ANSP 156000, 6). Huanine (MNHN no #, 4). Nengonengo Isl. (USNM 638322, 1). Anuanu Raro, W of NE Isl. (USNM 725320, 9). Tatakoto Atoll (USNM 782721, 3). Tureia Isl. (USNM 638297, 2). Ravaka Isl. (= Raraka) (ANSP 264346, 4). Temoe Isl. (= Timoe Isl.) (USNM 671841, 1). SOCIETY ISL.: (LACM A.6186.52, 4). Tahiti (LACM A.6186.52a, 2; USNM 835592, 1). Moorea Isl. (ANSP 185142, 2; MNHN no #, 5). GAMBIER ISL.: Motu Tepapuri (USNM 726394, 1). HENDERSON ISL.: (USNM 732017, 24; BMNH 1913.7.28.7-9, 3). PITCAIRN ISL.: (USNM 789557, 1). Ducie Atoll (USNM 732115, 5). Oeno (USNM 731587, 22; USNM 789609, 6).

LITERATURE, LOCALITIES: Tahiti; Makatea; Aratika; Motutunga; Taenga; Marutea; Fakahina; Amanu; Vahitahi; Pinaki; S Marutea; Taraouroa (= Taraura Roa ?) (Dautzenberg & Bouge, 1933). Raraka, Raroia (Talmadge, 1963).

LITERATURE, RANGE: New Caledonia (not on map); Taumotu, Lord Hoods Isl. (Habe & Kosuge, 1964). Tuamotu Archipelago; Gambier Isl. (Talmadge, 1963). E Polynesia (Abbott & Dance, 1983). New Caledonia (not on map) (Salvat *et al.*, 1988).

Haliotis rubiginosa Reeve, 1846 (Figs. 24, 136, 137)

NSW: Lord Howe Isl. (BMNH 81.2.20.19-22, 4; USNM 851408, 2). NSW, Lord Howe Isl., Middle Beach (USNM 7914422, 6). Lord Howe Isl., Neds Beach (AMS C.328700, 1: complete; AMS C.328698, 1: complete). QLD., North-West Isl., Capricorn Group (MNHN no #, 1). TONGA: Nive (=Niue) (USNM 360748, 1).

LITERATURE, RANGE: Lord Howe Isl. (Talmadge, 1963; Hinton, 1978: as *howensis*). E Australia, Lord Howe Isl. (Abbott & Dance, 1983: as *howensis*).

Haliotis squamata Reeve, 1846 (Figs. 24, 63, 66)

NICOBAR: (BMNH 1829, 1). VIETNAM: Pulo Condor (9° 20' N 106° 40' E) (MNHN no #, 1) INDONESIA: Bali, Nusa Dua (LACM 86-164, 1: complete). SW Java, Sukabumi, Queens Bay (AMNH 103486, 2). Java, Batavia/Jakarta (MNHN no #, 1). Java, Drini Beach, near Jogjakarta (DLG AAB13g, 2). QLD.: GBR, off Cairns, Arlington Reef (AMNH 178752, 2). Near Gladstone (USNM 595682, 1). NSW: Sydney (MNHN no #, 2). NT: Taipang/Taypang Bay [= Trepang ?] (AMNH 114549, 1; MNHN no #, 1). Nhulunby, Gove Peninsula (BMNH 2341, 1). Yirrkala, Arnhem Land (USNM 602298, 14). Point Charles (ANSP 267918, 2). WA: Cape Leveque (USNM 618426, 3). King Sound (LACM A.2777, 2; AMNH 111949, 1). Broome (LACM 45877, 5; AMNH 169622a, 1). Broome, Gantheaume Point (LACM 45979, 3; DMNH 124207, 1). Broome, Quondong (AMNH 110146, 1). Broome, Roebuck Bay (AMNH 199647, 4; AMNH 182972, 4). Port Headland (LACM 45802, 1; LACM A.6548, 1). Rosemary Isl. (DLG AAB 13e, 2). Nicol Bay (LACM 45887, 1). Dampier (DLG AAB 13f, 4). Dampier Archipelago (SBMNH no #, 4). Point Samson (NHB 11 239-a, 1; NHB 11 244-a, 1). Barrow Isl. (USNM 692029, 1). Barrow Isl., Airport Beach (USNM 691996, 4: complete). Between Cape Dupuy and Cape Malouet (USNM 691874, 4: complete; USNM 691827, 13: complete). NE of Onslow, Montebello Isl., Trimouille Isl. (LACM 95-66, 2). NE of Onslow, Pasage Isl., Great Sandy Isl. (LACM 95-63, 8 + 1 complete; LACM 95-64, 1 + 1 with dried body). NE of Onslow, Weld Isl. (LACM 95-60, 2). Yanchey's [= Yanchep ?] Beach (LACM S.1114, 1). Murat, Exmouth (AMS C.328734, 3: complete). Learmouth, Exmouth Gulf (AMS C.328735, 2: complete). S. of Exmouth townsite, Exmouth Gulf (AMS C.328738, 3: complete), Bundegi Reef, Exmouth (AMS C.328732, 3: complete). Off Carnarvan (AMS C.328740, 2: complete). Port Gregory, N of Geraldton (AMS C.328733, 15: complete). Off Perth (DMNH 012213, 3). Swan River (BMNH no #, 5). Shark Bay (BMNH 2341, 1). Vlaming Head (AMNH 96444, 3). Cape Preston, Regnard Bay (SBMNH no #, 1). Cape Preston (AMNH 220131, 1). SE of False Cape Bossut, Lagrange Bay (ANSP 233326, 1).

LITERATURE, LOCALITIES: Java, Karang Hawoe; Bali, beach between Boegboeg and Boeitan (Adam & Leloup, 1938).

Sunda Straits; Prinz Eiland (= P. Panaitan); S coast of Java, Wynkoops Bay (= Pelabuhanratu, Teluk) (TALMADGE, 1963). Ningaloo Marine Park (WILSON, 1993).

LITERATURE, RANGE: W and NW Australia; Indonesia (TALMDGE, 1963). Shark Bay - NT (WILSON, 1993; WELLS & BRYCE, 1985). Bali, Lesser Sunda Isl. (DHARMA, 1988).

Haliotis varia Linnaeus, 1758 (Figs. 34, 37, 43, 163, 164)

TANZANIA: Zanzibar, Pwani Mchangani (ANSP 399945, 6: doubtful). MAURITIUS: (DMNH 011016, 3; DMNH 129904, 3: doubtful). MALDIVE ISL.: Rasdu Atoll (ANSP 253542, 1: doubtful). INDIA: Kilikkarai (DLG 15j, 1). Hare Isl. (= Musal Tivu), 6 miles SW Mandapam (ANSP 301461, 1). Coromandel Coast (AMNH 220252, 3). Shingle Isl., E of Krusadai Isl., SE Gulf of Mannar (ANSP 301249, 5). Waltair (USNM 622097, 1: complete). SRI LANKA: (BMNH 1838, 6; AMNH 48366, 1). Tricomale (DMNH 069887, 3; BMNH 1838, 12). Tricomale, E shore Fort Frederick (ANSP 211220, 10). Trincomale, Elisabeth Pt. (ANSP 210955, 1). Nilaveli, Pigeon Isl. (LACM 84-7, 6). Nayinativu Isl. (ANSP 225034, 3). Weligama Bay (ANSP 210842, 1). ANDAMANES: (DMNH 010980, 3; BMNH 73.3.10.17, 2). Port Blair (BMNH 1838, 8; BMNH 1838, 3). THAILAND: Phuket, Airoport Beach (ANSP 286646, 2). Phuket, Laam Seng, 1 mile S of Laam Son (ANSP 285840, 2). VIETNAM: Nha Trang (MNHN no #, 1). CHINA: (LACM 45867, 1). Hong Kong (BMNH no #, 1: complete). Hong Kong, E side High Isl., Port Shelter (ANSP 222679, 14). TAIWAN: (DMNH 118533, 72; LACM 45854, 3). Taipei Co, E of Chi-lung (= Keelung) (LACM 88-80, 3). W Lan Yii (= Hung-tou Hsü) (USNM 653768, 3). JAPAN: Honshu, Chiba, Yokahama (USNM 43067; USNM 43067, 1). Honshu, Kanagawa, O-shima, Amanago (ANSP 141829, 1). Honshu, Kanagawa, Oshima, Osumi (USNM 343823, 3). Honshu, Kanagawa, Oshima, Osumi, Kikai (USNM 304309, 4). Honshu, Wakayama, Kushimoto, Shiono-misaki (AMNH 239007, 4). Honshu, Wakayama, Shirahama, Kii (ANSP 252612, 3). Shikoku, Kochi, Tosa , Kashiwajima (ANSP 86241, 1). Shikoku, Kochi, Tosa, Kashizima (USNM 273362, 4; USNM 343832, 3). Kyushu, Kagoshima, Amami, O-shima (AMNH 241419, 5; ANSP uncataloged, 1). Ryukyu Isl. (= Loo Choo) (NMW, 1). Oku (LACM 77-61, 1: 87 mm). Mukojima, Bonin Isl. (= Ogasawara-shoto) (ANSP 252592, 2; USNM 343833, 3). Bonin Isl., Chichi Jima (USNM 621934, 1; USNM 621866, 1). Okinawa, Taguchi (DMNH 140614, 1). Okinawa, SSW Kadena (LACM 77-55, 1). Okinawa, Itoman Reef (LACM 72045, 4; LACM 72156, 2). Okinawa, Imbo Beach (LACM 28830, 3). Okinawa, Metasaki Reef (LACM 29332, 4). Okinawa, Onna Village, Horseshoe Cliffs (LACM 79-75, 1). Okinawa, 8 km E of Kawata (LACM 77-79, 2). Okinawa, Kadena Reef (AMNH 141067, 3). Okinawa, Sobe (AMNH 102963, 2). Okinawa, Imbu Bay (AMNH 156010, 5; AMNH 156010, 5). Okinawa, Sobe (AMNH 102963a, 1). Okinawa, Madimato (AMNH 187058, 7). Okinawa, 5 miles N of Kin (AMNH Jackson 1992 A9873, 7). Okinawa, Fuchaku (ANSP 302807, 2). Okinawa, White beach, 1.5 miles S of Henne (ANSP 302730, 1). Okinawa, Onna reef (SBMNH no #, 4). Okinawa, Yakena reef (SBMNH no #, 2; SBMNH no #, 16). Okinawa, Zampa-misaki (SBMNH no #, 1). Okinawa, off Civil Air Terminal, Naha (SBMNH no #, 1). Okinawa, Machinato Reef (SBMNH no #, 1). Okinawa, Kiusiu Isl., Shuri (USNM 362834, 1). Okinawa, Shima, Odonari (USNM 488158, 1). Okinawa, Shanawan Bay, Shioya (USNM 489109a, 1). PHILIPPINES: Luzon, Cape Engaño (DLG 15b, 1). Luzon, Batangas, Verde Isl. (DMNH 049712, 3). Luzon, Batangas, Calatagan (DMNH 004402, 8). Luzon, Batangas, between Culebra and Malajibomanoc Isl. (LACM 84-162, 2). Luzon, Bataan Province, Lusong Cove (LACM 74741, 24). Luzon, Bataan Province, Luson (LACM 152163, 2). Luzon, Bataan Province, S Corregidor Isl. (DMNH 003200, 1; LACM 74739, 2). Luzon, SE Bataan, Cabcaben (ANSP 231301, 1). Luzon, Manila (LACM A.2023, 5). Luzon, Manila Bay, Caballo Isl. (ANSP 229671, 2). Luzon, W tip of Corregidor Isl. (ANSP 230142, 10). Luzon, Sorsogon, Magallanes (LACM A.1930, 1; ANSP 223923, 6). Luzon, Sorsogon, Matnog (LACM 74735, 2). Luzon, Sorsogon, Barrio Lupi, Prieto Diaz (ANSP 224201, 3). Luzon, Sorsogon, Albay Gulf, Tabaco Bay (LACM 23549, 3). Luzon, Zambales, Iba (ANSP 229242, 13). Luzon, Maricaban Isl. (USNM 245506, 11; USNM 245511, 1). Luzon, Tayabas Province, Dingalan Bay, N of Otpegon Point (SBMNH 12243, 8). E Luzon, Butauanan Isl. (USNM 245501, 1). Luzon, W Palaui Isl. (USNM 245492, 2). Burias, Port Busin (USNM 245509, 1). Minodro (DMNH 011020, 2; BMNH, 1: complete). Mindoro, Lubang, Isl., Hulagaan Point (LACM 74742, 13). Minodro, Cabra Isl. (DMNH 049713, 7; LACM 45803, 1). Mindoro, Calipan (LACM 110395, 5; SBMNH 21572, 2). Mindoro, Calapan (ANSP 242231, 7; ANSP 249501, 17). Mindoro, Calapan, Hoecapilato (ANSP 399936, 1). Mindoro, Dumai Point (AMNH 80448, 5; AMNH 80448a, 2). Mindoro, Ambil Isl. (AMNH 220188, 6). Mindoro, Naujan (USNM 30337, 1). Mindoro, Lubang, Port Tiliq (USNM 245541, 4). Catanduanes, Gigmoto (DMNH 002110, 16; AMNH 220254, 3). Catanduanes, Bugas Point (LACM 74722, 1 with dried body). Samar (DLG 15u, 1). Samar, Batag Isl. (USNM 245504, 1). Samar, Borongon (DMNH 001906, 7; ANSP 223339, 15). Samar, Catbalogan (USNM 245526, 2; USNM 245514, 1). Palawan, Calamian Group, Culion Isl. (DMNH 140315, 1; LACM 74736, 1). Palawan, Calamian Group, Culion, Leper Colony (LACM 91279, 2; AMNH 197954, 1). Palawan, Calamian Group, Busuanga, Port Galton/Balton (USNM 245519, 1). Palawan, Calamian Group, Busuanga Isl., Dinaran Isl. (LACM 74703, 1). Palawan, Cuyo Isl. (ANSP 223512, 1). Palawan, Observatory Isl., Malubutglubut Isl. (USNM 245491, 4). Palawan, Ulugan Bay (USNM 245499, 1). NW Palawan, Ulugan Bay (AMNH 132220, 1). Palawan, Dalanganem Isl. (USNM 345393, 4; USNM 245495, 1). Palawan, Balabac Isl. (SBMNH no #, 5). Panay, Borokay Isl. (DMNH 122611, 1). Bohol, Panglao (DLG 15g, 3). Mindanao, Camiguin Isl., Port Pio (USNM 245490, 2). Mindanao, Zamboanga (DMNH 061283, 1; AMNH 220255, 3). Mindanao, Santa Cruz Isl., off Zamboanga (USNM 245549, 1). Mindanao, Davao (DMNH 136928, 2; DMNH 118538, 2). Mindanao, Davao, Pongit, Hijo (ANSP 133357, 1).

Mindanao, Near Davao (ANSP 118912, 10). Mindanao, Balut Isl., Darangani Isl. (USNM 245557, 3). Mindanao, Lianga Bay (USNM 245558, 1). Mindanao, Polloc (USNM 245516, 5). Mindanao, Panabutan (USNM 245542, 5; USNM 245508, 2). Sulu Archipelago, Siasi Isl. (DMNH 028211, 4; AMNH 279267, 1). Sulu Archipelago, outside reef and barrier reef S of Muso and Siasi Isl. (ANSP 318245, 39). Sulu Archipelago, Sanga Sanga Isl. (DMNH 003939, 4). Sulu Archipelago, SW Sanga Sanga Isl., Bongao Channel (DMNH 003018, 6; ANSP 230772, 50). Sulu Archipelago, Jolo Isl., off Muobo Beach (ANSP 318344, 1). Sulu Archipelago, Tabawan Isl. (ANSP 318295, 1). Sulu Archipelago, Jolo Isl. (USNM 245537, 1). Sulu Archipelago, Tawi Tawi group, Papatag Isl. (USNM 245512, 1). Cebu (LACM 34588, 1; ANSP 50185, 2). Cebu, Cebu City (SBMNH no #, 1). Cebu, Bantayan Isl. (LACM 45924, 1). Quezon, Polillo Group, Cabaloa (LACM 74721, 1). Quezon, Polillo Group, E Ikon Isl. (LACM 74738, 11). Quezon, Baler (AMNH 103709, 2). Masbate Province, Ticao Isl., Taclagan Bay (LACM 74726, 1). Masbate, Wumusung Point (USNM 245560, 1). Capul (BMNH 1829, 3). 2 km S of Olango, E of Cebu, Salpa (ANSP 230457, 1). Negros Oriental, Guihulhga (SBMNH 28937, 2). GUAM: Alupat Isl., Agana Bay, Guam Isl. (ANSP 197355, 1). PALAU (= BELAU): SE shore Aurapushelaru Isl., Malakal Harbor (ANSP 202501, 1). Airai, Babelthuap, reef oposite, 07° 22' N 134° 34' E (ANSP 202687, 1). FEDERATE STATES OF MICRONESIA: Round rock, Helen Channel, Helen Reef (ANSP 399941, 1). INDONESIA: Ambon (DMNH 009556, 2; NHB 5439d, 2). Ambon, Saparoea (MNHN no #, 1). E of Ambon, Haruku Strait, Pombo Isl. (USNM 746572, 1: complete). N Sulawesi, off Manado, S Bunaken and Siladen Isl. (LACM 88-56, 1: complete). Java, off Jakarta Raya, Pulau-Pulau Seribu Isl., Pelangi and Putri Isl. (LACM 86-163, 1). Java, Batavia/Jakarta (MNHN no #, 1). Java, Sukabumi (AMNH 220130, 1). Timor (AMNH 221449, 1). Sumatra, Banda (ANSP 281223, 2). Lompok, Senggigi Beach, Mangait Point (SBMNH 5617, 2). SW Sumatra, N of Sipora, Pulau Siburu (USNM 654889A 1; USNM 654703A, 2). SW Sumatra, Mentawai Isl., Pulau Stupei (USNM 655162, 2). Off Sumatra, Pulau Batu Group (USNM 654480A, 3). Flores (NHB 4394.b, 6). Celebes Isl. (USNM 617400, 3). Irian Jaya, Biak Isl., Biak (LACM 88-43, 1). Irian Jaya, Biak Isl., W of Biak (LACM 88-52, 2). Irian Jaya, N Japen, Ambai Isl., Maroepi (ANSP 208567, 1). Irian Java, Japen, W Samberbaba, Cape Tekopi (ANSP 205122, 1). Irian Jaya, Pai Isl., Mios Woendi Atoll, Reef E of Padaio Isl. (ANSP 205067, 1). Irian Jaya, Noesi Isl., Mios Woendi Atoll, Reef E of Padaido Isl. (ANSP 205039, 1). Irian Jaya, Abroeki Isle, Maransabadi, Isl., Aoeri Isl., Geelvink Bay (ANSP 208636, 2; ANSP 207547, 2). W Irian Jaya, near Sorong (AMNH 125348, 6). Irian Jaya, Sorong (NMBE 1507.382, 1). Aroe and Tenimber Isl. (NHB 5439-b, 3). N Aru, N Toba Isl. (USNM 755376, 1). Tanimbar, Jamdena Straits, 2 miles N of Tg Nuan (USNM 747571, 1). Tanimbar, Jamdena Straits, W Mitak Isl. (USNM 747546, 1). Kai Isl., N of Du Rowa, N of Nuhu Rowa (USNM 746993, 1). Kai Isl., Tajundu Isl., E Ree Isl. (USNM 746732, 1: complete). Kai Isl., Tajundu Isl., Warantneu (USNM 746772, 1). Ceram Isl. (USNM 837284, 1). Halamahera Isl., Tobelo District, Bobi (USNM 837126, 2). Halmahera Isl., Jailolo District, Pasir Putih (USNM 837195, 18). MALAYSIA: Peninsular, Perhentian Isl. (BMNH 2264, 1; BMNH 2264, 1). Off Mersing coast, Pulau Babi Besar (ANSP 319229, 4). Borneo, Sabah (DMNH 049710, 2; AMNH 175467, 1). Borneo, Sabah, Sapi (DMNH 201327, 1). Borneo, Sabah, Jesselton, Sapi Isl. (USNM 658276, 1; USNM 658277, 4). Borneo, Sabah, Jesselton (ANSP 274999, 6; ANSP 275051, 7). Borneo, Sabah, Jesselton, Sapangar Isl. (NMW). Borneo, Sabah, Jesselton, Gaya Isl. (USNM 658287, 6). Borneo, Sabah, Jesselton, Sabang (USNM 658293, 6). Borneo, Sabah, Seporna (BMNH 2277, 2). Borneo, Sabah, Malawali Isl. (NMW; USNM 887464, 1). Borneo, Sabah, Malawali Isl., Permuan (NMW, 1). Borneo, Kudat, Bak Bak (USNM 632352, 3; USNM 633018, 1). N Borneo, Kudat (AMNH 220133, 1). Borneo, Marudu Bay (ANSP 255847, 1). Borneo, 6 miles N of Kudata, W Marudu Bay (ANSP 255710, 2). N Borneo, Mandi Darrah Isl. (AMNH 106759, 3). S Gomumu Isl., S of Obi Isl. (USNM 746446, 2: complete). Manipa Isl., N Tg Hapale (USNM 746475, 1: complete). WA: 35 miles N of Broome, James Prince Point (ANSP 233549, 15). 17 miles N of Broome, 0.5 mile S of Willy Creek (ANSP 233507, 3). Broome (AMNH 272135, 2; AMNH 279269, 1). Broome, Port (BMNH; LACM 72012, 4). Broome, Entrance Point (ANSP 233014, 19). Broome, Cable Beach (BMNH 2341, 2). 1 mile NE of Broome, Gantheaume Point (ANSP 232692, 21). Broome, 2 miles SW of Jetty (ANSP 233107, 2). Broome, Riddel's Beach (SBMNH 6138, 5). Port Headland (LACM 45861, 3; LACM 45801, 2). Perth (DMNH 012214, 3). Perth, Swan River (BMNH no #, 1). Onslow, 2 miles W of Onslow Jetty, Ward Reef (ANSP 267421, 1). 130 miles from Onslow, Cape Preston (AMNH 163394, 1). Barrow Isl., S Flacourt Bay (USNM 691881, 1: complete). Dampier Archipelago (SBMNH no #, 2). Quobba Point, 40 miles N of Carnarvon (ANSP 238529, 4). Monte Bello Isl. (BMNH no #, 1). 1 mile SE of False Cape Bossut, La Grange Bay (ANSP 233333, 3). Cygnet Head (AMNH 111950, 2). Point Samson (NHB 5439e, 1). 4 miles N of Red Bluff (ANSP 268029, 1). Christmas Isl. (BMNH no #, 1). 80 Mile Beach (NHB 5439-f, 1). Carmarvan, Cambridge Bay (BMNH 1913.7.7.195, 1). NT: Darwin (LACM 45850, 1; LACM 45880, 2). Port Darwin (ANSP 193247, 5). Point Charles (ANSP 267917, 5). Port Essington (BMNH 1829, 3). NE end of Gulf of Carpenteria, Eylandt (USNM 602260, 1). QLD.: Gulf of Carpenteria, Wallaby Isl. (SBMNH 31463, 5). Torres straits (BMNH; AMNH 285411, 1). Torres Straits, Thursday Isl., W Snodon (BMNH no #, 1). Lizard Isl., Casurina Beach (USNM 783328, 1). SE Lizard Isl. (LACM 79-55, 1; LACM 79-54, 1). SW Lizard Isl. (LACM 79-53, 3: complete). Hook Isl. via Prosperine (SBMNH 228, 6). Port Douglas (SBMNH 203, 3). Low Isl. (SBMNH 226, 2; BMNH, 1: complete). Cairns (DMNH 031897, 4; AMNH 272156, 2). Cairns, Hasting's Reef (DMNH 179654, 3). GBR, off Cairns, Arlington Reef (AMNH 178751, 1; LACM 45947, 8). GBR, Fitzroy Lagoon (AMNH 144302, 6). Townsville (LACM 45800, 2). Off Townsville, Davies Reef (BMNH 2341, 1).

Orpheus Isl., Fig Tree Bay (SBMNH 6137, 2). Townsville, Palm Group, Esk Isl. (SBMNH 227, 3; SBMNH 2639, 1). Whitsunday Group, Black Isl. (ANSP uncataloged, 2). Whitsunday Group, Hook Isl., Mackerel Bay (BMNH 2341, 3). Whitsunday Group, Hook Isl., Langord Reef (AMNH 104533, 2). Whitsunday Group, S Molle Isl., Paddle Bay (LACM 29660, 2). Whitsunday Group, Glochester Isl. (AMNH 220129, 4). GBR, Lindeman Isl. (LACM 45943, 12; ANSP 138604, 1). Proserpine (AMNH 272149, 1). Proserpine, Shute Harbour (LACM 45799, 2). Bowen (AMNH 189533, 12). Mackay (SBMNH no #, 1). Yeppoon (AMNH 215146, 2; SBMNH 213, 3). Bamborough Isl. (AMNH Jackson 1992 A9873, 2). Keppel Isl. (AMNH 272155, 3; AMNH 163124, 2: complete). Capricorn Isl. (AMNH 85706, 1). Capricorn Gourp, North West Isl. (ANSP 236332, 2; ANSP uncataloged, 3). Capricorn Group, One Tree Isl. (ANSP 236314, 2). Capricorn Group, Tryon Isl. (USNM 617151, 4). Capricorn Group, Wreck Isl. (SBMNH WW2332, 2). GBR, Holbourne Isl. (ANSP 138767, 2). Curtis Isl. (AMNH 80432, 2). Hinchinbrook Isl., Palm Isl. Group, Orpheus Isl. (AMNH 178912, 2). Hinchinbrook, Beaver Reef (AMNH 121864, 2; AMNH Edison A9853, 2). Brook Isl. (ANSP 134521, 6). Heron Isl. (DMNH 094026, 1; DMNH 186028, 4). GBR, Pandora reef (ANSP 134667, 1). Queen's Beach (LACM 45906, 3). PNG: Kapa Kapa (DMNH 047217, 2). Madang (AMNH 215144, 2). Madang province, Astrolabe Bay, Nagada, Tab Isl. (LACM 80-24). Port Moresby Bay (ANSP 219621, 3; ANSP 247692, 2). Port Moresby (ANSP 242539, 2). New Britain, Rabaul Harbor (ANSP 274801, 6). New Brittain, Matapit Isl., 5 miles from Rabaul (ANSP 304733, 3). Admirality Isl., Koruniat Isl., near Manus (ANSP 181932, 3). Trobriand Isl. (AMNH 215145, 1). Goodenough Isl. (AMNH 124564, 1). Conflict Group (BMNH). Louisade Archipelago (BMNH no #, 4). SOLOMON ISL.: Guadalcanal, NW (DMNH 053167, 3). Guadalcanal, Honiara (DMNH 059188, 3; BMNH no #, 3). Guadalcanal, Honiara, Point Cruz (SBMNH 1997, 5). Guadalcanal, Marau Sound (AMNH 183045, 1). Guadalcanal, Marau Sound, S Marapa Isl. (LACM 78-68.15, 1). Guadalcanal, Marau Sound, Tavanipupu Isl. (SBMNH 25669, 3; SBMNH 3503, 14). Guadalcanal, Merow (AMNH 82286, 1). Gudalcanal, Lunga (AMNH 220186, 3). Tulaghi Isl. (AMNH 81883, 1; AMNH 82253, 1). Bunana (= Bunala) (LACM 45842, 2; BMNH 2144, 1). Malaita (LACM 45902, 2). Malaita, Su'u (AMNH 82130, 41; AMNH 82130, >50). Malaita, Ataa (ANSP 289619, 2; AMNH 118202, 3). N Malaita (DMNH 050854, 1). N Malaita, Auki (DMNH 046851, 2; BMNH, 3: complete). Shortland Isl. (ANSP 310059, 2). Shortland Isl., Bougainville (LACM 45864, 1; LACM 45859, 2). Shortland Isl., Bougainville, Buin (LACM 45873, 4; ANSP 267125, 4). Shortland Isl., Bougainville, Kieta (AMNH 82159, 1; AMNH 82166, 5). Shortland Isl., Faisi (AMNH 82124, 3). Choiseul Isl., Bambatani (AMNH 82235, 3; AMNH 82244, 1). Choiseul Isl., Luti (AMNH 82254, 7). Choiseul Isl., Choiseul Bay (AMNH 81887, 2; AMNH 81886, 4). Santa Ana Isl. (AMNH 81877, 1). San Cristoval (LACM 45872, 1; ANSP 167545, 1). New Georgia (AMNH 220185, 4). New Georgia, Munda (SBMNH 1602, 1). Santa Cruz Group, Reef Isl., Pigeon Isl. (SBMNH no #, 1). NEW CALEDONIA: (AMNH 220216, 2). Koumac (MNHN sta. 1303, 1). VANUATU: Efate (ANSP 222846, 1). Efate, Undine Bay (DMNH 053602, 1, 1: complete; DMNH 052472, 3). Efate, Mele Bay (BMNH 2341, 2; SBMNH 25677, 3). Efate, N Mele Bay (SBMNH 0091, 2). Efate, Mele Bay, N of Port Vila (BMNH 2341, 5; SBMNH 3173, 2). Efate, Vila, Le Lagoon (SBMNH 2625, 11: 2 dried bodies; SBMNH 40081, 7: 4 dried bodies). Efate, off Port Havannah (SBMNH no #, 4; SBMNH 25963, 3). Efate, Baie d'Erakor (SBMNH 25645, 3). Efate, N Moso Isl., Shortland Isl. (BMNH 2341, 1). Efate Isl., E Ennis Point, Erakor Reef (LACM 77-37, 2). Lamap, Malicolo Isl. (ANSP 243153, 1). FIJI: (BMNH; LACM A.1463, 1). Vanua Levu, Savusavu Bay (AMNH 141409, 1). TONGA, Vava'u (DLG 15n, 2). Tongatapu (SBMNH no #, 1: with dried body). Tongatapu, Havannah Isl., Nuku'alofa (SBMNH no #, 5). COOK ISL.: Aitutaki (SBMNH 2732, 2).

LITERATURE, LOCALITIES: Lompok, Labuan Pandan; Karakelang (= Karakelong) Isl., Beo; Waigeo, Wunoh Bay; W Kur [= Koor] Isl., Kilsuin; S Rot[t]i Isl., Buka Bay (SCHEPMAN, 1909). Molluccas, Halmahera; Bachan; Tidore (= Soasiu); Misol; SE of Ceram, Kur [= Koor] Isl.; N of Timor, Kisser [= Kisar]; Solor; Flores, Larentuka; Java; S Java, Palabuan [= Palabuhanratu ?]; N Celebes; N Togean Isl.; Sangir Isl.; Talaut (= Talaud) Isl. (OOSTINGH, 1925). Bangaan Isl. (IREDALE, 1929). Bali, beach between Boegboeg and Boeitan; Celebes, Gulf of Paloe (= Palu); Between Banda Neira and Goenoeng Api; Banda Neira (= Bandanaira); N of Misoöl, Weim Isl.; Port of Soembawa (= Sumbawa); Pisang Isl.; Banda Archipelago (= Bandanaira), between Lonto Isl. and Goenoeng Api (ADAM & LELOUP, 1938). Gulf of Carpenteria, Groote Eylandt (COTTON, 1943). India, Pamban area (SATYAMURTI, 1952). Leyte; Kwajalein; Schouten Isl.; Trobriand Isl.; Bougainville; Lifu; Fiji, Suva (TALMADGE, 1963). Capricorn Group; Keppel Isl.; Bowen; Townsville; Magnetic Isl.; Cairns; Darwin; Broome; Biak (TALMADGE, 1974). NW Australia, Cockatoo Isl. (ANON., 1975). Norfolk Isl. (WILSON, 1993).

LITERATURE, RANGE: N Australia (ALLEN, 1959). S Honshu and S (KIRA, 1962). Ryukyu; Philippines; Marianas; Caroline Isl.; Marshall isl.; Dutch New Guinea; Solomon Isl.; Papua New Guinea; Loyality Isl.; Fiji; Friendly Isl. (TALMADGE, 1963). N, E and W Australia; Indonesia; Philippines; China; Ryukyu; Amami Isl.; Kyushu Isl.; Shikoku Isl.; S Honshu - Kii Peninsula; Malaya; Nicobar; Ceylon; India; Mauritius; Red Sea; E coast of Africa (HABE & KOSUGE, 1964). PNG (HINTON, 1972). Point Quobba, WA - QLD (WELLS & BRYCE, 1985). Indonesia (DHARMA, 1988). Indo-West Pacific; Abrolhos,WA - S QLD (WILSON, 1993).

Australian Endemic Species (Figs. 45-67, 131, 132, 134, 135, 183-192)

Haliotis brazieri **Angas**, 1869 (Figs. 45, 48, 67)

NSW: The Entrance (AMNH 220152, 2). Solitary Isl., Coffs Harbor (SBMNH 6642, 1). Split Solitary Isl. (AMS C.149015, 1: complete; AMS C.328770, 1: complete). Broken Bay (USNM

162181, 2). Sydney, Vaucluse Point (ANSP 50231, 1; USNM 515804, 1). Sydney, Collaroy Beach (LACM 45960, 3; LACM 45964, 4). Port Jackson (DMNH 010965, 1). Port Jackson, off Shark Bay (BMNH no #, 1). Port Jackson, Bottles and Glass Rock (ANSP 50227, 1). Cronulla (LACM 45875, 2). Shellharbor (AMNH 179676, 4). Jervis Bay (SBMNH 52707, 1). Off Currarong, near Jervis Bay (AMS C.327855, 1: complete). Off Bowen Isl., Jervis Bay (AMS C.328703, 1: complete). Whale Point, Crockhaven Bight, 35° 02' S 150° 53' E (AMS C.328702, 1: complete). Bass Point, SE of Shell Harbour, 34° 36' S 150° 35 E (WAM C.328704, 1: complete).

LITERATURE, LOCALITIES: NSW, Lake Macquarie; Port Jackson, Watson's Bay (ANGAS, 1871). SA, Arno Bay; QLD., Caloundra (COTTON, 1943). Port Jackson (ANON., 1975). Sydney (WILSON, 1993).

LITERATURE, RANGE: S QLD. - Jervis Bay (WILSON, 1993).

Haliotis coccoradiata **Reeve**, 1846 (**Figs. 47, 50, 67, 186**)

QLD.: Lizard Isl. (USNM 766895, 1: complete). Moreton Bay (DLG AAB 23e, 1). Brisbane, Balmoral Beach (AMNH 220156, 1). Stanage Bay (DLG AAB 23f, 1). Bowen, Brampton Reef (AMNH 220154, 4). Proserpine (AMNH ex 272149, 1). Mossman (AMNH 96443, 2). Cumberland Group, on reefs (BMNH 1829, 3). GBR, Lindeman Isl. (LACM 45942, > 50). NSW: Montague Isl., off Narooma (AMS C.328732, 1: complete). Ballina (LACM S.2926, 1). The Entrance (AMNH 220155, 3). 25 miles S of Newcastle (SBMNH no #, 3). S shore Broken Bay near The Entrance (ANSP 137975, 8). Solitary Isl., Coffs Harbor (DLG AAB 23d, 1). 15 km N of Forster, Black Head (BMNH 2341, 10). 30 km S of Forster, Seal Rocks (BMNH 2341, 1). Port Jackson (LACM 45988, 2; LACM 45974, 3). Manly Beach (USNM 842776, 5). Sydney, Long Bay (DMNH 118535, 2). Sydney, Long Reef (AMNH 183923, 13; AMNH 220158, 8). Sydney, Long Reef, Collaroy (BMNH Smythe collection, 1). Sydney, Long Beach, Collaroy Beach (LACM 45879, 2; ANSP 228191, 3). Sydney, Botany Bay (AMNH 279266, 1). Sydney, Botany Bay, Solander Monument (ANSP 399935, 7). Sydney, Botany Bay, Bare Isl. (SBMNH 222, 2). Sydney, Kurnell (AMNH 179794, 4; ANSP uncataloged, 2). Sydney, Long Reef (LACM 79-58, 3). Sydney, Middle Harbor (LACM 79-59, 1). Sydney Harbor, Bottle and Glass Reef (LACM A.6548, 1). Bollaroy, Long Reef (LACM H-3338, 2). Jervis Bay, Green Point (LACM 80-63, 1). Broulee-Batesman Bay (NHB 11 250-a, 2). South Durras, Batesman Bay (NHB 11 250-b, 1). McMasters Beach (AMNH 220157, 6). Angourie (ANSP 219615, 1). Rous County, Tweed Heads (ANSP 138447, 2). VIC: Melbourne, Port Philip Bay, Ricket Point (LACM 79-49, 1). TAS: Hobart (MNHN no #, 1).

LITERATURE, LOCALITIES: VIC, Tullaburga Isl. (COTTON, 1943). Botany Bay (WILSON, 1993).

LITERATURE, RANGE: NSW - E VIC (ALLEN, 1959; WILSON, 1993). SE Australia (HINTON, 1978; ABBOTT & DANCE, 1983).

Haliotis cyclobates **Péron & Lesueur**, 1816 (**Figs. 51, 52, 67, 185**)

QLD.: Capricorn Group (LACM 45891, 1). SA: Venus Bay (NHB 10 906-b, 1). Spencer Gulf, Moonta Bay (DMNH ex 008703, 1; LACM 45952). Spencer Gulf (LACM A.2777a, 1). Encounter Bay (AMNH 80425, 4). Port Willunga (AMNH 220168, 4). Normanville (AMNH 220167, 5). Edithburg (SBMNH 6161, 2; SBMNH 6141, 1). Port Gawler (SBMNH no #, 2). Adelaide (DMNH 049720, 6; LACM A.2777, 2). Adelaide, Glenelg (DMNH 009567, 2; LACM 34580, 1). Adelaide, Brighton (LACM A.52, 5). Adelaide, Henley Beach (DMNH 179565, 2). Adelaide, Outer Harbor, Section Bank (LACM 45987, 1). Adelaide, Outer Harbour (DMNH 049720, 6; DMNH 136901, 3). Adelaide, Seacliff Reef (AMNH 252365, 1). Adelaide, Semaphore Beach (NHB 10.906a, 2). Adelaide, West Beach (AMNH 121848, 2). Adelaide, Largs Bay (SBMNH no #, 3; SBMNH 185, 2). Port Adelaide (LACM 45889, 1). St. Vincent's Gulf (LACM 45939, 2; AMNH 220166, 1). St. Vincent Gulf, Marina (ANSP 219620, 1). Point Vincent (LACM S.584, 4; LACM 22187, 3). Wallaroo (ANSP uncataloged, 1). Tumby Bay (LACM 28820, 1). Port Lincoln (ANSP 193224, 1; AMNH 252700, 3). Kangaroo Isl. (AMNH 11945, 3; AMNH 141077, 1). Eyre Peninsula, Peake Bay (AMNH Edison A9853, 3). TAS: Rocky Bay (NHB 11 225-b, 1). WA: Perth (LACM 45937, 1). Swan River (AMNH 23099, 1; USNM 16958, 1).

LITERATURE, LOCALITIES: Port Philip (COTTON & GODFREY, 1933). SA, Corny Point (COTTON, 1943). VIC, Portsea (MACPHERSON & GABRIEL, 1962). Tiapara Isl.; West Isl. (SHEPHERD & LAWS, 1974). Garden Isl. (WILSON, 1993).

LITERATURE, RANGE: Streaky Bay - Spencer Gulf (COTTON & GODFREY, 1933). SA and VIC (ALLEN, 1959). Esperance - South East Cape (SHEPHERD, 1973). Esperance - SA (WELLS & BRYCE, 1985). Esperance - W VIC (LUDBROOK & GOWLETT-HOLMES, 1989). Recherche Archipelago - SA (WILSON, 1993).

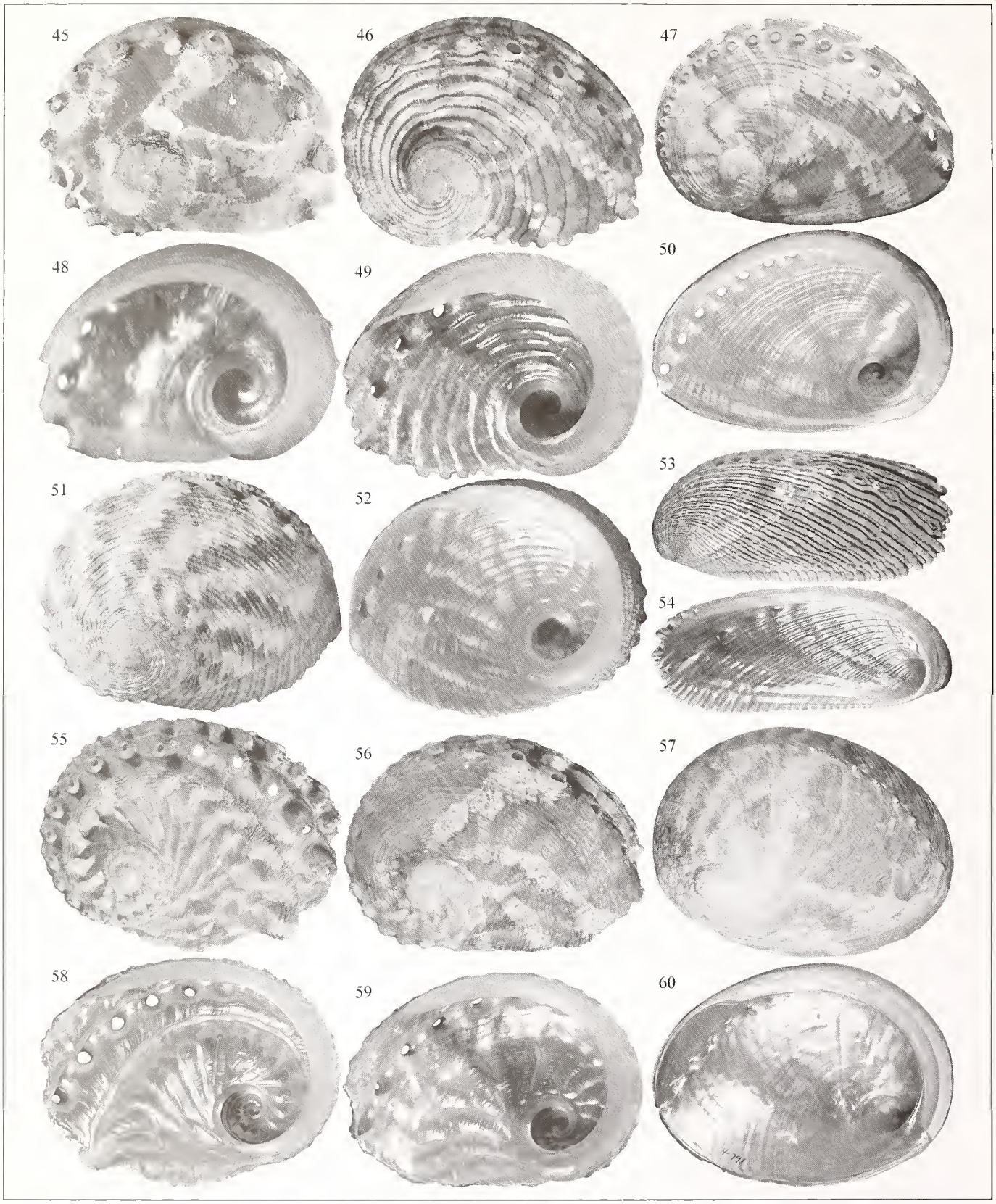
Haliotis elegans **Philippi**, 1844 (**Figs. 53, 54, 67, 192**)

NSW: Sydney, Mosman River (MNHN no #, 1). SA: Adelaide (BMNH 2351, 1). WA: Ledge Paiut (AMNH 220181, 1). Albany (DLG AAB 24b, 2). Jurien Bay (AMNH Jackson 1992 A9873, 4). Augusta (WAM S1003, 1: complete; WAM S1004, 1: complete). Green Isl. (AMNH 276881, 1; AMNH 220182, 1). Margaret River (LACM 45881, 3). Cowaramup Bay (AMNH 120839, 4). Rockingham, Pt. Peron (LACM 45965, 1). Swan River (BMNH no #, 1). Perth (SBMNH 5142, 1). Freemantle (USNM 877162, 2; SBMNH no #, 3). Rottnest Isl. (LACM 117638, 1; LACM 87-91, 1). Horrocks Beach, via North Hampton (SBMNH 212, 2). Shark Bay (SBMNH W4567, 1). Broome (AMNH 169622, 2).

LITERATURE, RANGE: Jurien Bay - Esperance (WELLS & BRYCE, 1985). Geraldton - Esperance (WILSON, 1993).

Haliotis hargravesi **Cox**, 1869 (**Figs. 46, 49, 67, 189**)

NSW: La Perouse, Botany Bay (ANSP 399934, 1). Off Currarong, near Jervis Bay (AMS C.327855, 1: complete). Solitary Isl., Coffs Harbor (SBMNH no #, 10). W. side, off Coffs Harbour (AMS C.327856, 1: complete; AMS C.327857, 1



Figs. 45-60. Shells of abalone endemic to Australia I. Figs. 45, 48. *Haliotis brazieri* Angas, 1869. DLG AAB 43a. Coffs Harbor, Solitary Island. 30 mm. Figs. 46-49. *Haliotis hargavesi* Cox, 1869. DLG AAB 42b. Coffs Harbor, Solitary Island. 31 mm. Figs. 47, 50. *Haliotis coccoradiata* Reeve, 1846. BMNH type lot. Type locality : "?". 57 mm. This is the largest of three species and not the one marked "type". Figs. 51-52. *Haliotis cyclobates* Péron & Lesueur, 1816. DLG AAB 35a. Port Lincoln, South Australia. 57 mm. Figs. 53-54. *Haliotis elegans* Philippi, 1844. DLG AAB 24b. Albany, Western Australia. 72 mm. Figs. 55, 58. *Haliotis s. scalaris* Leach, 1814. DLG AAB 20a. Western Australia. 66 mm. Figs. 56, 59. *Haliotis scalaris emmae* Reeve, 1846. DLG AAB 06b. South Australia. 58 mm. Figs. 57, 60. *Haliotis laevigata* Donovan, 1898. LACM H-791. Phillip Isl., Victoria. Earl Huffman coll. 115 mm.

body). Split Solitary Isl. (AMS C.149015, 1: complete). Cook Isl., Tweed River Head (AMS C.327854, 1: complete). WA: Quaboba (= Quobba) (BMNH no #, 2).

LITERATURE, LOCALITIES: NSW, Broken Bay Heads (ANGAS, 1871). Jervis Bay (WILSON, 1993).

LITERATURE, RANGE: SE Australia (HINTON, 1978). NE Australia; E Australia (ABBOTT & DANCE, 1983: including *ethologus*). S Qld, N NSW (WILSON, 1993).

Haliotis laevigata **Donovan, 1808 (Figs. 57, 60, 67, 184)**

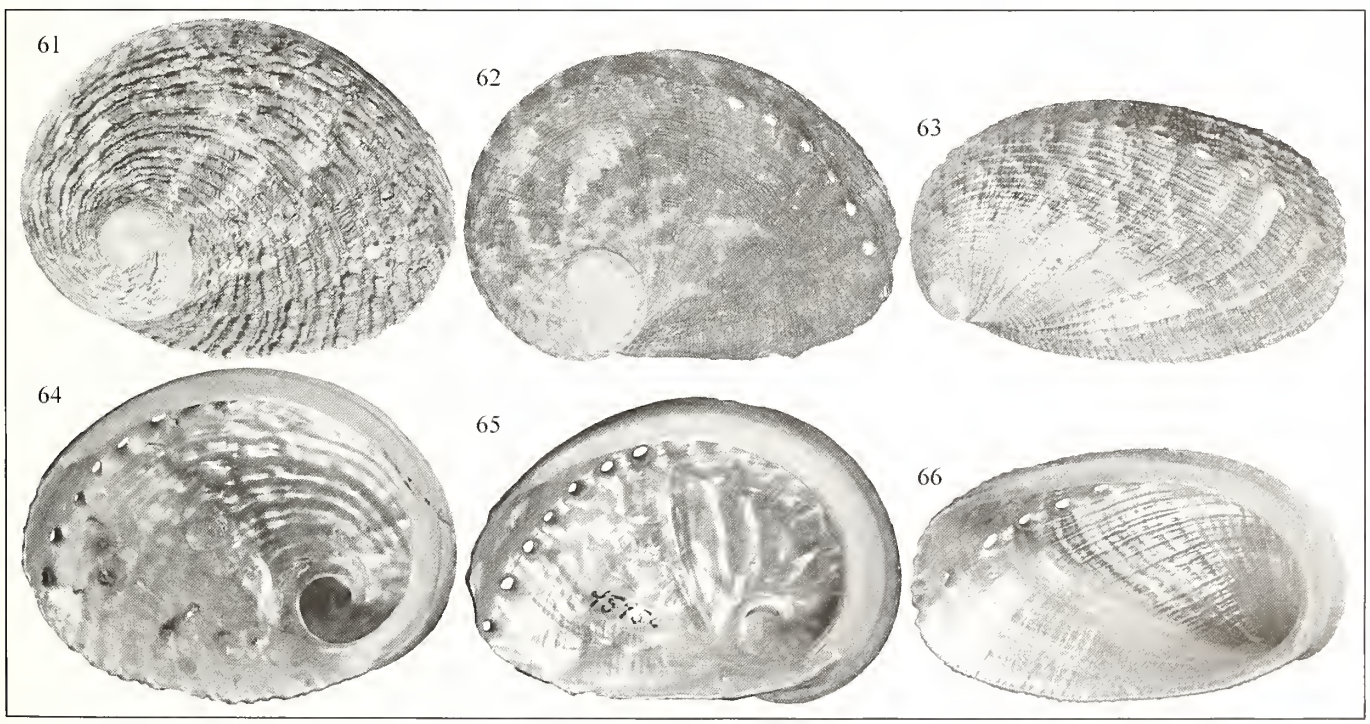
VIC: Torquay (DMNH 127475, 1; DMNH 127654, 1). E of Geelong, Point Londsdale (NMBE 1478.95, 1). Phillip Isl. (DMNH 186161, 1). Westernport Bay, W Head, Phillip Isl. (LACM H-791, 2). San Remo near Melbourne (ANSP 98914, 7). Cambertwell (MNHN no #, 1). Portsea (LACM 45806, 1). Portland Bay (AMNH 105235, 2). Lakes Entrance (SBMNH 236, 5). SA: Yorke Peninsula, Stansbury (LACM 45813, 2; USNM 890100, 1). Yorke Peninsula, Sultana Bay (LACM 45815, 2). Yorke Peninsula, Wool Bay (LACM A.3664, 2; A.2777, 1). Normanville (AMNH 220198, 2). Kangaroo Isl. (ANSP 219617, 1). Ocean Beach, Flinders (AMNH 111935, 1). Edithburg, Hickey's Point (SBMNH 671, 2). Hardwicke Bay (LACM 45794, 1). Corny Point (AMNH 121847, 1). Tumby Bay (SBMNH no #, 1). Port Lincoln (SBMNH 241, 3; SBMNH 25536, 1). 25 miles S of Port Lincoln, Thorny Passage (AMNH 1666125, 1). Wallaroo (ANSP uncataloged, 1). Port Victoria (AMNH 100811, 5). TAS: (LACM 17619, 1; = Van Diemen's Land: BMNH 37.7.15.299, 1). Flinders (LACM 79-47, 1; BMNH 93.3.2.451, 1). NW TAS (LACM A.7759, 1). Montagu (AMNH 199047, 2). Stanley (BMNH 2341, 3). WA: E of Albany, Two Peoples Bay, near Pt. Valliant (LACM 87-96, 1). Albany (DMNH 012211, 3; LACM 127440, 1). Albany, Nanarup (AMNH 110345, 1). Near Albany, King George Sound, Frenchman Bay (LACM 87-97, 1). E of Albany, Cheyne Beach (BMNH 2237, 2). Swan River (BMNH no #, 2). Margaret River (LACM A.5787, 1). Geralton (LACM 116190, 2; ANSP uncataloged, 2). Port Augusta (AMNH 152476, 9). Augusta (AMNH 272138, 2; AMNH 220197, 1). Augusta, Ring Bolt Bay (AMNH 169587, 2). Esperance, Esperance Bay (SBMNH 242, 3).

LITERATURE, LOCALITIES: King George Sound (COTTON & GODFREY, 1933). Murchison; Reevesby Isl. (COTTON, 1959). Sorrento; Queenscliff; VIC, Portsea (MACPHERSON & GABRIEL, 1962). SA, West Isl.; Tiapara Reef (SHEPHERD & HEARN, 1983). SE Tip of Eyre Peninsula, Taylor Isl.; Owen Isl. (SHEPHERD *et al.*, 1992a). SA, Sceale Bay; McLaren Point; Taylor Isl.; Yanerbie; Anxious Bay; Waterloo Bay (SHEPHERD *et al.*, 1992b).

LITERATURE, RANGE: St. Francis Isl. - Glenelg (COTTON & GODFREY, 1933). Cape Naturaliste - TAS, Burnie (SHEPHERD, 1973). Cape Naturaliste - VIC, TAS (WELLS & BRYCE, 1985; WILSON, 1993). Cape Naturaliste - Esperance; Arno Bay - W of Head of Bight, S Coast Kangaroo Isl., SW Eyre Peninsula - Wallaroo (MACE, 1986). S WA - E Bass Strait (LUDBROOK & GOWLETT-HOLMES, 1989).

Haliotis roei **Gray, 1826 (Figs. 61, 64, 67, 188)**

SA: Aldinga (AMNH 220225, 2). Kangaroo Isl. (USNM 347085, 2). Kangaroo Isl., Hog Bay (LACM A. 8589, 1). Yorke Peninsula (AMNH ex 220176, 1). Giles Point (LACM 22216, 1; LACM A.2777, 2). Adelaide, Glenelg (AMNH 105233, 3). Port Willunga (SBMNH 21047, 1). Gulf of Vincente (ANSP



Figs. 61-66. Shells of abalone endemic to Australia II. Figs. 61, 64. *Haliotis roei* Gray, 1826. DLG AAB 17a. Freemantel, Western Australia. 81 mm. Figs. 62, 65. *Haliotis rubra* Leach, 1814. LACM 45950. St. Vincent Gulf, South Australia. 79 mm. Figs. 63, 66. *Haliotis squamata* Reeve, 1846. DLG AAB 13c. Port Headland, Western Australia. 50 mm.

uncataloged, 2). Eye's Peninsula, Elliston (SBMNH 19805, 4). WA: Shark Bay (DLG AAB 17b, 1). Kalbarri (NHB 1708-b, 10). 6 miles S of Geralton, 1mile S of Greenough River mouth (LACM 45916, 1; SBMNH 0001, 8). Geralton, Moore Point, Geralton Lighthouse (LACM 95-58, 4). Yanchep Beach (LACM 22218, 1). N of Perth, Trigg Isl. (BMNH 2341, 13; USNM 790684, 2). N of Perth, Marmion Beach (AMNH 241175, 1). Perth (DMNH 011037, 2; DMNH 175704, 1). Perth, Watermans Bay (USNM 847083, 2). Swan River (ANSP 193249, 1; BMNH 38.7.22.26.27, 2). Cottesloe (LACM 45827). Freemantle (DMNH 012212, 3; AMNH 80447, 17). Freemantle, Rottnest Isl. (LACM 28832, 1; USNM 794728, 1: complete). Rottnest Isl., Cape Vlamingh (USNM 878898, 2). Freemantle, Trigg Isl. (ANSP 263203, 1; AMNH 111944, 1). Bunbury (BMNH 2351, 1). Rockingham (LACM 45817, 3). S of Cape Clairault, Moses Rock (LACM 95-53, 25). Leeuwin-Naturaliste National Park, Cowaramup Bay (LACM 45907, 3; LACM 87-100, 11). Cape Leeuwin (BMNH 2351, 2). N Cape Mentelle (LACM 95-55, 1 + 1 complete). Augusta (SBMNH 273, 2). Near Augusta, E Cape Leeuwin (LACM 87-98, 2). Yallingup (AMNH 80428, 2; AMNH 80442, 3). E of Cape Naturaliste, Bunker Bay (LACM 95-57, 1). Cape Naturaliste, Bunkers Bay (LACM 87-93,14; USNM 691539, 3: complete). Cape Naturaliste (BMNH 2351, 6). Cape Naturaliste, N of Lighthouse (USNM 291502, 1: complete). Albany (BMNH 2351, 1). E of Albany, Two Peoples Bay (LACM 87-96, 23). Near Albanay, King George Sound, Frenchman Bay (LACM 87-97, 5; LACM 87-94, 2). King George Sound, Mistaken Isl. (USNM 858568, 2). King George Sound, Pricess Royal Harbour (USNM 867220, 2). King George Sound, Barker Bay, Quarantine (USNM 867074, 6). Peaceful Bay (SBMNH 184, 7).

LITERATURE, LOCALITIES: Yorke Peninsula, Corny Point; Guichen Bay; Encounter Bay; Port Willunga; Edithburgh; Arno Bay; St. Francis Isl.; Beard Bay (COTTON & GODFREY, 1933). King George Sound; Ellenbrook; Guichen Bay (COTTON, 1959). VIC, Portland (MACPHERSON & GABRIEL, 1962). SA, Tiapara Reef; West Isl. (SHEPHERD & LAWS, 1974). Greenough (ANON., 1987). WA, N of Pert, Waterman Bay (WELLS & KEESING, 1989). WA, Marmion Marine Park; SA, Point Brown (WILSON, 1993).

LITERATURE, RANGE: Shark Bay - Cape Otway (ANON., 1987). Shark Bay - South East Cape (SHEPHERD, 1973). Shark Bay - W VIC (WELLS & BRYCE, 1985; LUDBROOK & GOWLETT-HOLMES, 1989; WILSON, 1993). Geraldton - Cape Leeuwin (MACE, 1986).

Haliotis rubra Leach, 1814 (Figs. 62, 65, 67, 183)

NT: Port Darwin (DMNH 010998, 3). QLD.: 40 miles N of Port Douglas near Guradine (AMNH 121839, 2). GBR, Lindeman Isl. (LACM 45826, 49; LACM 45830, 1). Townsville (SBMNH no # 2). NSW: Ballina, Lennex Head (LACM A.2777, 1). 15 km N of Forster, Black Head (BMNH 2341, 4). Port Stephens (DMNH 179568, 1). Soldier's Point (AMNH 267915, 1). Newcastle (USNM 101771, 2). 25 miles S of Newcastle (SBMNH no #, 1). The Entrance, Blue Bay (AMNH 100809, 2). Swansea Head (LACM 45936, 1). Sydney, Newport (USNM 835596, 2). Sydney, Long Reef (MNHN no #, 1; MNHN no #, 1). Sydney, Narrabeen (DMNH 036875, 1). Sydney, Newport Reef (LACM 63152, 2). Sydney, Mossman (AMNH ex 96443, 1). Sydney, N of Manly, Long Reef (ANSP 134141, 3; AMNH 157802, 1). Sydney, Manly, Fairy Bower (USNM 842816, 1; USNM 842817, 3). Sydney, Coogee Bay (ANSP 136952, 82). Sydney, Bondy Bay (BMNH 44.12.6.205-6, 2). Sydney, Collaroy (USNM 784028, 1). Botany Bay, La Perouse (ANSP 134399, 4; AMNH 220230, 2). Botany Bay, Solander Monument (ANSP 149674, 2). Port Jackson (LACM A. 3664a, 4; LACM 105829, 1). Vicinity of Sydney, Palm Beach (AMNH 220232, 2). Nowra (NHB 11 225-e, 1). Woononga Beach (LACM 45929, 1). Bellambie Point (AMNH 152500, 2). Jervis Bay, Callala Bay (DLG AAB 22f, 1). Jervis Bay, Iluka (LACM 63331, 1). S side of Jervis Bay (LACM 79-43, 5). Jervis Bay, Huckisson (LACM 80-64, 1). Cape Jervis (AMNH Edison A9853, 2). Ulladulla (SBMNH 223, 17). 17 miles S of Ulladulla, Pebbly Beach (SBMNH 225, 7). Narooma (LACM 30502, 1). Batesman Bay, Batehaven, Corrigan's Beach (BMNH 2341, 4; BMNH 2341, 4). Broule Batesman Bay (NHB 11 225-a, 2). Eden (AMNH 276883, 1; ANSP uncataloged, 2). Eden, Two Fold Bay (NHB 11 225-d, 1; NHB 11 250-c, 1). VIC: Mallacoota (NMBE 1477.19, 1). Lakes Entrance (DMNH 011000, 2). Mornington (LACM S.4635, 1). Melbourne (LACM 59331, 2; ANSP 209463, 2). Melbourne, Port Phillip Bay, Rickett Point (LACM 79-49, 8). Richmond near Melbourne (ANSP 94152, 1). San Remo near Melbourne (ANSP 98915, 3; ANSP 98037, 10). Geelong West (LACM A.8487.68, 1; LACM 45828, 1). Torquay (DMNH 127548, 1; DMNH 185341, 2). Sorrento (BMNH Smythe collection, 1). Port Phillip, Sandringham (ANSP 134915, 1). Phillip Isl. (LACM H-797, 4; ANSP 219619, 1). Phillip Isl. Kitty Miller Beach (LACM 28834, 7). Philip Isl., Western Port (AMNH 173497, 4). Philip Isl., SW of Ventnda (BMNH 2341, 14). Flinders and Philipp Isl., near Melbourne (BMNH 2036, 8). Lorne (LACM S.5041, 6; LACM 23652, 4). Otways, Skene's Creek (BMNH 2341, 1). 9 miles ESE of Port Campbell, near Castle Rock, Gibson Beach (BMNH no #, 1). Warrnambool (ANSP 219618, 1). Portland Bay (AMNH 105236, 3). Portland (BMNH 2351, 3). Port Fairy (ANSP 134967, 6). Portsea (LACM 45833, 3). Lorne, Point Grey (USNM 767396, 1). SA: Port MacDonnell (SBMNH 25566, 3; AMNH 175334, 4). Port Noarlunga (DMNH 010999, 2). South Semaphore near Adelaide (ANSP 219627, 3). Giles Point (USNM 347083, 4). Hallett's Cove (LACM 45973, 2). Point Willunga (LACM 20217, 3; LACM 45976, 2). Port Willunga (LACM A2777c, 1; LACM 152168, 1). Aldinga Bay (MNHN no #, 2). Aldinga (AMNH 240646, 1; BMNH 2351, 1). Cape Jervis (AMNH 240647, 2). Kangaroo Isl. (AMNH 80453, 2). Kangaroo Isl., Hog Bay (LACM A2777a, 1). St. Vincent Gulf (LACM 45950, 2; MNHN no #, 1). Moonta Bay (LACM 45920, 2). Wallaroo (ANSP uncataloged, 2). Yorke Pola [= Yorketown ?) (DMNH 008694, 1). Corny Point (SBMNH no #, 3). Spencer Gulf, Port Pieri (USNM 381723, 5). Westernport Bay, West Head, Flinders (LACM 79-47, 1). Near Edithburgh (USNM 877521,

2). Eyre's Peninsula (SBMNH 50069, 1). Port Lincoln (SBMNH no #, 3; SBMNH 190, 4). Flinders (LACM 71876, 10; USNM 365732, 1). Stansbury (AMNH ex 220178, 1). Hardwicke Bay (AMNH 220231, 4). Eye's Peninsula, Elliston (SBMNH 18863, 2). Streaky Bay (USNM 835595, 1). TAS: (ANSP 185897, 1; = Van Diemen's Land: BMNH, no #, 4). Stanley (BMNH 2341, 3). Hobart, Battery Point (LACM 20390, 1; LACM 45910, 10). S TAS, Saltwater River (LACM S.1113, 3; LACM 22217, 3). Adventure Bay, Bruny Isl. (ANSP 312839, 1). Middleton Channel (LACM 45819, 1). WA: Eyre (DLG AAB 22c, 1). Esperance (DLG AAB 21b, 2). Albany (LACM 127441, 4; AMNH 105234, 5). Cape Naturaliste (BMNH 2237, 1). Cape Leeuwin (LACM 127442, 3). Cowaramup (AMNH 169687, 1; AMNH 152482, 1). Geographe Bay (USNM 877522, 5). Perth (LACM 45835, 1; LACM 45981, 1). Safety Bay, Penguin Isl. (USNM 847082, 1: complete).

LITERATURE, LOCALITIES: SA, Guichen Bay; Beachport; Kangaroo Isl.; Middleton; St. Francis Isl; Marino Rocks; WA, Ellenbrook (COTTON, 1943). SA, Port Elliston, Swan River; King George Sound; Robe (COTTON, 1959). Flinders Isl.; VIC, Shoreham; Frankston, Mordialloc, Sorrento, Port Philip (MACPHERSON & GABRIEL, 1962: some as *conicopora*). Bastion Point; Sandpatch Point; Tullaburga Isl. (MCSHANE *et al.*, 1988). TAS, Ninepin Point (PRINCE *et al.*, 1987). TAS, Port Esperance, Blubber Head (PRINCE *et al.*, 1988). SA, Tiapara Reef (SHEPHERD & HEARN, 1983). VIC, Gabo Isl.; Petrel Pt.; Petrel Rock; Cape Schanck; Apollo Bay; SA, West Isl.; Waterloo Bay, Pearson Isl.; WA, Cape Arid (BROWN, 1991). TAS, Hogan Isl.; Kent Isl.; Babel Isl.; Cape Barren Isl.; Waterhouse Isl. (NASH *et al.*, 1994).

LITERATURE, RANGE: St. Francis Isl. - SA, Glenelg; Yorke Peninsula (COTTON & GODFREY, 1933). Rottnest Isl. - Coffs Harbour (SHEPHERD, 1973). Freemantle - VIC (WELLS & BRYCE, 1985: as *conicopora*). TAS, Flinder's Isl., King Isl., Kangaroo Isl. (not in Gulf of Vincente) - Broken Bay, SW Eyre Pen. - Wallaroo, Arno Bay - Cape Wondorma (MACE, 1986). Freemantle - VIC; SA - NSW, TAS (WILSON, 1993: part as *conicopora*).

Haliotis scalaris **Leach, 1814 (Figs. 55, 56, 58, 59, 67, 190)**

NSW: Sydney, Long Reef (LACM H-338a, 1). VIC: Flinder's Isl. (LACM 28835, 2). Philip Isl., Westernport Bay, Sandy Point (LACM 79-50, 1). Philip Isl., Cat Bay (SBMNH 204, 3). Western Port (ANSP 132937, 1). TAS: (AMNH 182974, 2; = Van Diemens Land: NMBE Schuttleworth, 2). Blyth (LACM 45927, 1). SA: Tumby Bay (AMNH Edison A9853, 1; SBMNH 205, 1). Port Lincoln (SBMNH 224, 1; SBMNH 25216, 8). Point Lincoln (WAM S1007, 1: complete). Adelaide (LACM 45986, 1). Adelaide, Glenelg, Broadway Reef (LACM 91288, 1). Adelaide, Glenelg, Kemps Ground (AMNH 252366, 1). Marino (MNHN no #, 4; MNHN no #, 2). Pt Willunga (LACM 120215, 2; LACM H-794, 5). S of Adelaide, near Rapid Bay, Second Bay (LACM 76-42). Spencer Gulf, Moonta Bay (LACM 45954, 2; DMNH 008703, 2). Wallaroo (ANSP uncataloged, 2). Stansbury (AMNH 220178, 1). Yorke Peninsula (AMNH 220176, 6). Normanville (AMNH 220175, 1; AMNH 220239, 2). Cape Jervis (AMNH 80426, 2). St. Vincent Gulf (AMNH Edison A9853, 1). Kangaroo Isl., Hog Bay (LACM 22219, 1; LACM S.1112, 2). Port McDonnell (AMNH 175334, 1). WA: Geralton (LACM 45855, 1). Jurien Bay (AMNH Jackson 1992 A9873, 10). N of Perth, Marmion (AMNH 272147, 2). Perth (LACM 45849, 1). Perth, 2 mile Beach off Sorrento, off Limestone Reef (AMNH 220240, 2). Perth, Burns Beach (USNM 711213, 1). Swan River (ANSP 50223, 2; BMNH 52.7.28.37-38, 2). Freemantle (DMNH 010200, 2; AMNH 199100, 2). Freemantle, Rottnest Isl. (LACM 87-91, 4; AMNH 203252, 3). Perth, Cockburn Sound, Woodmans Point (USNM 672361, 3). Bunbury (AMNH 240638, 3; BMNH no #, 7). Geography Bay (AMNH 252370, 1). Cape Naturaliste (DMNH 011004, 2; USNM 691501, 2: complete). Cape Naturaliste, Eagle Bay (BMNH 2237, 2). Cape Naturaliste - Cape Leeuwin National Park, Gracetown, Cowaramup Bay (LACM 45834, 1; LACM 95-56, 1: complete). Cape Naturaliste, Bunker Bay (USNM 691540, 2: complete). S of Cape Clairault (LACM 95-53, 2). Margaret River (LACM 45919, 7; LACM 45945, 11). Albany (SBMNH 36202, 1, MHNG 21812, 1). Albany, Frenchman's Bay (DMNH 011007, 1; LACM 30387, 1). Albany, Freemantle Bay (LACM 29948, 1). NT: Darwin (BMNH Smythe collection, 1). INDONESIA: Java (AMNH 23110, 1).

LITERATURE, LOCALITIES: Esperance; Ellenbrook; Edithburgh; St. Francis Isl.; Point Sinclair; Kingston; Guichen Bay (COTTON & GODFREY, 1933). Corny Point; Gulf of Vincente (COTTON, 1943). Port Willunga (COTTON, 1959). VIC, Sorrento (MACPHERSON & GABRIEL, 1962: as *emmae*). SA, West Isl. (SHEPHERD & GODOY, 1989). WA, Marmion Marine Park (WILSON, 1993).

LITERATURE, RANGE: Geraldton - central TAS (SHEPHERD, 1973). Jurien Bay - VIC and TAS (WELLS & BRYCE, 1985). Geraldton - SA (LUDBROOK & GOWLETT-HOLMES, 1989). Geraldton - W SA; VIC, TAS - W SA (WILSON, 1993: as *emmae*).

Haliotis semiplicata **Menke, 1843 (Figs. 67, 131, 132, 134, 135, 187)**

NSW: Port Jackson (NMBE Schuttleworth 397, 1). Woononga Beach [= Woonana ?] (LACM 120209, 1 [?]). VIC: Sorrento (AMNH 272148, 1). WA: Esperance (DLG AAB 11c, 3). Albany, Goode Beach (LACM 29630, 1). Busselton (LACM 127439, 1). Bunbury (AMNH 220242, 1). Freemantle (DMNH 012825, 2; WAM S1005, 1: complete). Garden Isl. (DLG AAB 11a, 1). Freemantle, Rottnest Isl. (SBMNH no #, 1). Off Freemantle, Carnac Isl. (SBMNH 6168, 2). Cowaramup Bay (AMNH 152485, 2; AMNH 169641, 2). Cape Mentelle (WAM S1006, 1: complete).

LITERATURE, LOCALITIES: WA, Marmion Marine Park; Cottesloe (WILSON, 1993).

LITERATURE, RANGE: Freemantle - Esperance (WELLS & BRYCE, 1985). Geralton - Esperance (WILSON, 1993).

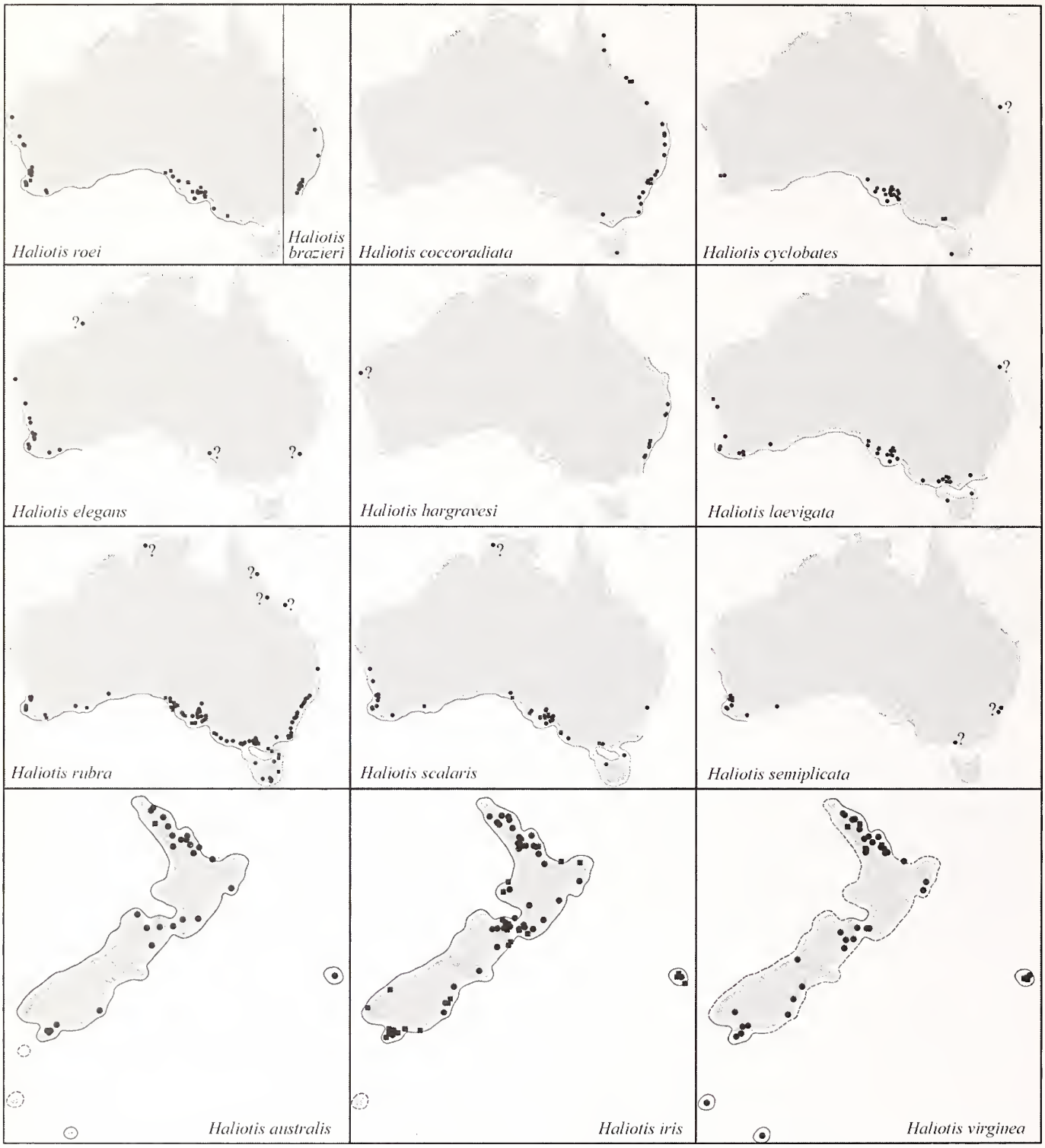
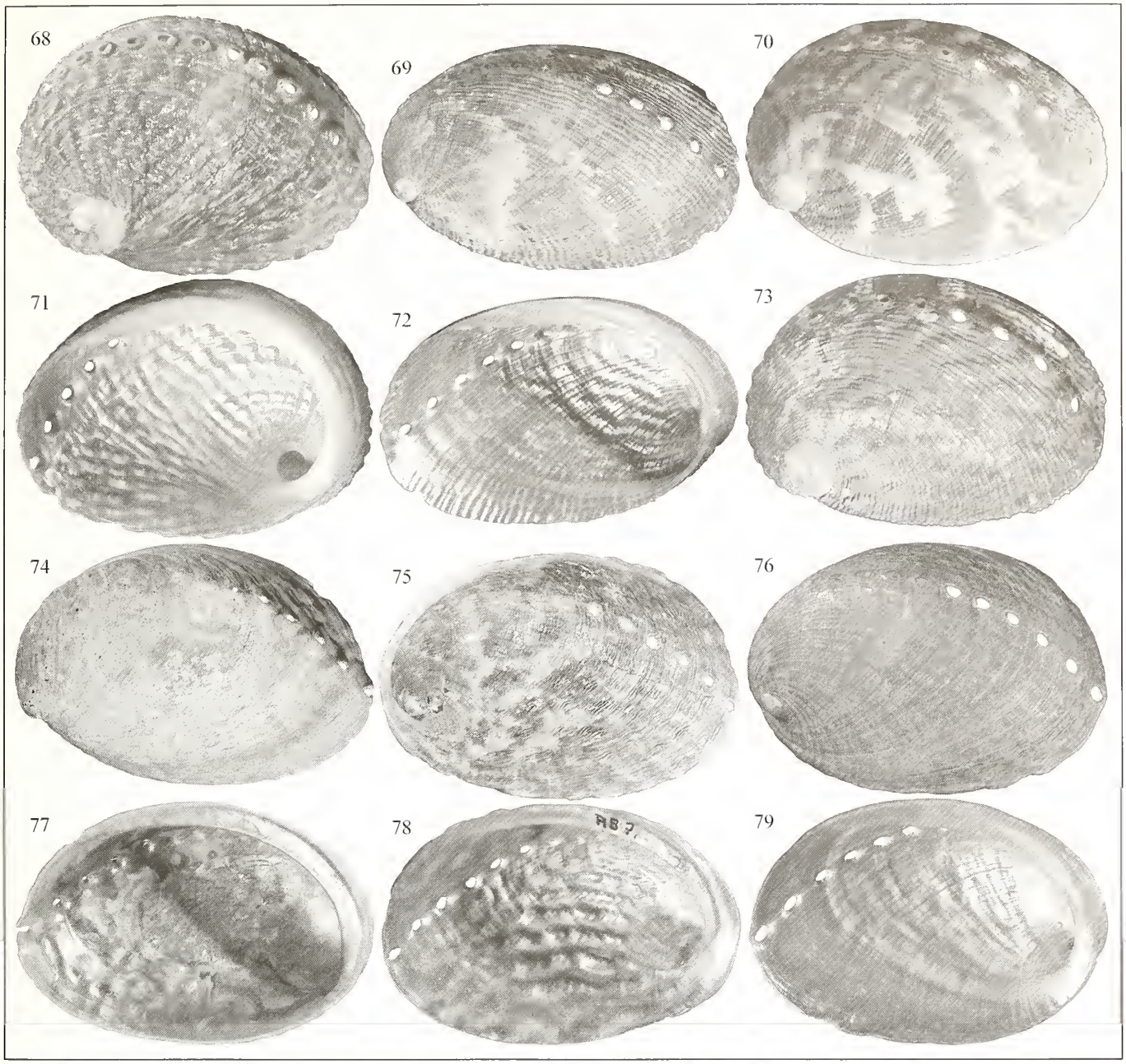


Fig. 67. Distribution of endemic Australian and New Zealand species of *Haliotis* spp. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

New Zealand Species (Figs. 67-79, 177-182)

Haliotis australis Gmelin, 1791(Figs. 67, 68, 71, 177, 178)

NEW ZEALAND: N Isl., Whangaroa, Stephenson's Isl. (DMNH 131736, 2). N Isl., Doubtless Bay (AMNH 116153, 1). N Isl., Northland, Bay of Isl. (DMNH 010963, 4; LACM 2777c, 1). N Isl., Northland, Bay of Isl., Kerikeri, Opito Bay (LACM 112167, 1). N Isl., Northland, Bay of Isl., Russell (LACM 110349, 2). N Isl., Great Barrier Isl., Tryphena (AMNH 80451, 2; AMNH 141080, 1). N Isl., Northland, Whangarei Head (ANSP 219626, 2). N Isl., Northland, Whangarei Bay (LACM 45874, 2). N Isl., Northland,



Figs. 68-79. Shells of New Zealand abalone. Figs. 68, 71. *Haliotis australis* Gmelin, 1791. DLG AAB 40b. New Zealand. 53 mm. Figs. 69, 70, 72, 73. *Haliotis virginea* Reeve, 1846. Figs. 69, 72. DLG AAB 30a. Marlborough. 41 mm. Dorsal and ventral view of green variation. Fig. 70. DLG AAB 30a. 41 mm. Marlborough. Dorsal. Fig. 73. DLG AAB 30b. Taupiri Bay, Northland, North Island. 31 mm. Dorsal view of red crispata variation. Note undulating folds and coarser cords. Figs. 74-79. *Haliotis iris* Gmelin, 1791. Figs. 74, 77. DLG AAB 07a. No locality. 102 mm. Adult with characteristic muscle scar. Figs. 75, 78. DLG 07c. Kaikoura, South Island. 41 mm. Subadult without muscle scar, but with indication of flared columella. Figs. 76, 79. DLG 07f. Nelson, South Island. 26 mm. Juvenile without muscle scar and no flared columella. Note similarity to adult *H. virginea*.

Whangarei, Pat's Beach (LACM 28822, 1). N Isl., Whangamata (SBMNH 31773, 2). N Isl., N Auckland (LACM S.1050, 1; LACM 22214, 1). N Isl., N Auchland, Whale Bay (AMNH 91998, 2; AMNH 220147, 3). N Isl., Bay of Plenty (AMNH 199438, 4; USNM 889966, 1). N Isl., Auckland, Marfelts Beach (DMNH 155567, 1). N Isl., off Alderman Isl. (DMNH 040906, 1). N Isl., Cape Colville, Fletcher's Bay (DMNH 130278, 1; ANSP 167580, 1). N Isl., Hauraki Gulf (LACM 110461, 1). N Isl., Mahia Peninsula (LACM 63015, 1). N Isl., Mahia, Hawke's Point (SBMNH 13080, 2). N Isl., Kuaotunu Beach (LACM 91285, 2). N Isl., Castlepoint (LACM 25764, 1). N Isl., Otaki (BMNH 2113, 5). N Isl., Wellington (LACM 2777a, 1; LACM 22221, 1). N Isl., Wellington, Makara Beach (MNHN no #, 1). N Isl., Wellington, E Isl. Bay (LACM 87-87, 2). N Isl., Wellington, Breaker Bay (LACM 112168, 3). N Isl., Wellington, Lyall Bay (LACM 45969, 4; AMNH 276878, 2). N Isl., Wellington Harbor (AMNH 199051, 4). N Isl., Wellington, Isl. Bay (AMNH 84995, 2). N Isl., Wellington Heads (AMNH 80429, 1). N Isl., Wellington, Sinclair Head (USNM 637952, 2). N Isl., Leigh (LACM 87-82,

1; USNM 680555, 1). N Isl., Leigh, Okahari Point (LACM 87-83, 1). S Isl., Pakawau (LACM 2777b, 1). S Isl., Cook Strait, Picton (AMNH 109103, 3). S Isl., Nelson (DMNH 011853, 61). S Isl., W Nelson, Paturau River Mouth (ANSP 283647, 3). S Isl., Kaikoura (AMNH 182267, 5; MNHN no #, 1). S Isl., Bluff (AMNH 220150, 3). Chatham Isl. (ANSP 399933, 1; SBMNH 33445, 1). Otago, Kartigi Beach (USNM 680557, 3). Chatham Isl., Owenga Beach (LACM 62958, 4; AMNH 276880, 1). Stewart Isl. (LACM 45975, 1; AMNH 92403, 2). Stewart Isl., Paterson, Inlet (AMNH 105536, 3; ANSP 284733, 2). Stewart Isl., Native Isl. (AMNH 126329, 4). Stewart Isl., Traill's Bay (AMNH 126331, 3; 126330, 3).

LITERATURE, LOCALITIES: Lyall Bay. (LINDNER, 1975). N Isl., Mount Maunganui (UBALDI, 1986).

LITERATURE, RANGE: New Zealand, Chatham, Snares, Auckland (SUTER, 1913). North and South Isl., Snares, Stewart Isl., Chatham Isl. (UBALDI, 1986).

Haliotis iris Gmelin, 1791 (Figs. 67, 74-79, 179, 180)

NEW ZEALAND: N Isl., Gisborne (AMNH 100806, 19). N Isl., Opononi, Hokianga Harbor (USNM 680553, 2). N Isl., Whangaroa, Mahinepua (SBMNH no #, 1). N Isl., Ahipara Bay, Reef Point (AMNH 116079, 5; AMNH 116100, 1). N Isl., Maunganui (LACM 18926, 2). N Isl., Northland, Bay of Isl. (LACM A.2777c, 1; AMNH 272137, 1). N Isl., Northland, Bay of Isl., Whangarei Heads (LACM A.3948, 3; LACM A.2777b, 2). N Isl., Northland, Bay of Isl., Russell (LACM 110354, 3). N Isl., NW Point on Motutapu Isl. (ANSP 234041, 4). N Isl., Great Barrier Isl. (LACM 45948, 1; 45977, 2). N Isl., Great Barrier Isl., Port Abercrombie (LACM A.2777, 1). N Isl., Great Barrier Isl., Midland Beach (SBMNH no #, 2). N Isl., Waiheke Bay (LACM 45796, 1; ANSP 219623, 3). N Isl., Auckland, Whitianga (USNM 749321, 1). N Isl., Gulf of Hauraki, Takatu Passage, Kawau Isl. (USNM 617409, 2). N Isl., Auckland (BMNH 1894, 4). N Isl., N Auckland, Little Manly (USNM 680556, 4). N Isl., Tarakani (= Mount Egmont), Cape Lighthouse (DMNH 033841, 2). N Isl., Paekakariki (DMNH 155558, 1; DMNH 155902, 1). N Isl., Uriti Beach (LACM 25770, 1). N Isl., Leigh (LACM 127462, 7). N Isl., Leigh Marine Laboratory (LACM 87-82, 1). N Isl., W of Leigh Marine Laboratories, Okahari Point (LACM 87-83, 2). N Isl., Kuaotumo Reef (LACM 91772, 1; LACM 91283, 2). N Isl., Turanga Bay (LACM 91305, 1). N Isl., Mercury Bay (USNM 749320, 2; USNM 749241, 1). N Isl., Whangamata (SBMNH 31774, 3). N Isl., Bay of Plenty, Mt. Maunganui (USNM 680554, 1; SBMNH 2662, 4). N Isl., Hawke's Bay, Cape Kidnappers (LACM 88-175). N Isl., Castlepoint (MNHN no #, 1). N Isl., Makara Beach (MNHN no #, 2). N Isl., Wellington, Lower Hutt (DLG AAB 07d, 2). N Isl., Wellington, E Isl. Bay (LACM 87-87, 2). N Isl., Wellington, Lyall Bay (AMNH 84994, 2). N Isl., Wellington, Reef Islet (USNM 637951, 2). N Isl., Wellington, Breaker Point (SBMNH no #, 2). N Isl., Wellington, Raekaihau Point (DLG no #, 11: complete). N Isl., Cook Strait (MNHN no #, 2). S Isl., Chetwode Isl. (AMNH 220190, 2). S Isl., Cook Strait, Picton (AMNH 109101, 1; AMNH 190111, 2). S Isl., Queen Charlotte Sound, Canibal Cove, N edge (DLG AAB 07e, 1). S Isl., Cable Bay (AMNH 116197, 5). S Isl., Nelson (DMNH 118541, 1). S Isl., Nelson, Fairwell Spit (DMNH 049716, 2). S Isl., Nelson, Golden Bay, Tata Point (AMNH Edison A9853, 1). S Isl., W Nelson, Kaihaka (AMNH Edison A9853, 1). S Isl., Kaikoura (DMNH 038954, 2; ANSP 219624, 1). S Isl., Timaru (AMNH 80427). S Isl., B. St. Otago, Tautuhu (SBMNH 28350, 1). S Isl., Christchurch (NHB 1709-b, 4). S Isl., Christchurch Beach (LACM 28672, 2). S Isl., Shag Point (LACM 23455, 3; AMNH 111943, 1). Stewart Isl. (DMNH 049715, 2; LACM 23454, 1). Stewart Isl., Ruggedy Point (LACM 140020, 1). Stewart Isl., Half Moon Bay (LACM 45811, 3). Stewart Isl., Ringa Ringa (AMNH 126327, 2; AMNH 220189, 2). Stewart Isl., Harrold's Bay (AMNH 126326, 3). Stewart Isl., Horseshoe Bay (AMNH 126472, 1). Stewart Isl., Native Isl. (AMNH 126325, 1). Stewart Isl., Mason Bay (AMNH 238752, 1). Stewart Isl., Traill's Bay (AMNH 126324, 3). Chatham Isl. (SBMNH no #, 1).

LITERATURE, LOCALITIES: Bay of Plenty (UBALDI, 1986). Chalky Inlet; Omaru; The Nuggets; Cape Runaway; Cape Egmont; Anchor Isl.; Bench Isl.; The Neck; Cape Jackson; Cape Young; Coal River; Codfish Isl.; Coromandel; E Ruggedy; Ruggedy W; Hapuku Rocks; Kakanui Point; Moeraki; New Plymouth; Palmer Head; Rangitoto Isl; Ruapuke Isl.; Sandy Point; Stony Creek; Te Kakako Isl.; Three leg woodhen; Tinui Isl; Tongue Point; Tory Channel; Tupari Bay; Cape Turikirae; Waikawa; Waituna; Waitui Bay; W of Cave Point; Christmas Isl.; Billhook Bay; Black Beach; Bushby Bay; Clay Point; Smoky Cape; Fighting Bay; Karoti Light; Cape Koamaru; Lawa's Point; Nicholson Bay; Perano Head; Robertson Point; Rollers Beach; Saddle Point; SE Harbour; Staircase; Steep Head (MCSHANE *et al.*, 1994).

LITERATURE, RANGE: New Zealand, Chatham, Auckland (SUTER, 1913). N and S Isl.; Stewart Isl.; Chatham Isl. (UBALDI, 1986).

Haliotis virginea Gmelin, 1791 (Figs. 67, 69, 70, 72, 73, 181, 182)

NEW ZEALAND: N Isl., Taipa Beach (AMNH 115954, 2). N Isl., Doubtless Bay (AMNH 116163, 2). N Isl., Northland, Taupiri Bay (SBMNH 6182, 1). N Isl., Northland, Whangarei (LACM 28818, 2; AMNH 85756, 4). N Isl., Near Whangarei, Taiharuru (AMNH Edison A9853, 2). N Isl., Northland, Hauraki Gulf, Leigh, Goat Isl. (AMNH 220259, 1; ANSP 250827, 2). N Isl., Northland, Hauraki Gulf, near Cape Rodney, Cat Isl. (AMNH 220260, 2). N Isl., Northland, Hauraki Gulf (DLG AAB 30c, 1). N Isl., Northland, Bay of Isl. (DMNH 027831, 33). N Isl., Northland, Bay of Isl., Tapeka Point (LACM H-3637). N Isl., Northland, Bay of Isl., Russell (LACM 152307, 1; SBMNH no #, 2). N Isl., Bay of Plenty (DMNH 027554, 2). N Isl., Auckland (DMNH 155568, 1). N Isl., Auckland, Waiheke Isl. (LACM 45866). N Isl., Slipper Isl. (DMNH 073974, 2). N Isl., Wellington (LACM 45925, 1; LACM S.133, 1). N Isl., Wellington, Lyall Bay (LACM 45903, 2; AMNH 167717, 3). N Isl., Kuaotunu Beach (LACM 91287, 1; LACM 91277, 1). N Isl., Mercury Bay, Whitianga (AMNH

220261, 3). N Isl., Mercury Bay, Simpson's Beach (ANSP 231956, 2). N Isl., Gisborne (AMNH 220137, 2). N Isl., Hawkes Bay, Mahia (SBMNH 13079, 3). N Isl., Great Barrier Isl. (LACM 45865, 3; SBMNH 31794, 1). N Isl., 1 km W of Leigh Marine Laboratory, near Okahari Point (LACM 87-83, 2; 87-84, 3). N Isl., Leigh (LACM 127461, 1). S Isl., Marlborough (DLG AAB 30a, 4). S Isl., Marlborough Sounds, Arapawa Isl. (AMNH 252349, 1). S Isl., Cape Campbell (AMNH 122292, 1). S Isl., Southland (LACM 112162, 3). S Isl., Dunedin (LACM A.3147, 2). S Isl., Dunedin, Dowling Bay (LACM H-2848, 2). S Isl., Awarau Bay (LACM 45923, 3). S Isl., Kai Koures Coast (DMNH 039249, 1). S Isl., Kaikoura (AMNH 182268, 6; SBMNH 26233, 9). S Isl., Oamaru (DMNH 054637, 2; DMNH 133524, 1). S Isl., Mahinepoa (DMNH 133525, 1). S Isl., Nelson (SBMNH 31775, 2). S Isl., Timaru (AMNH 199425, 5; ANSP 219622, 3). S Isl., Timaru, Caroline Bay (AMNH 220257, 2). S Isl., Foveaux Strait (AMNH 169585, 3; AMNH 87449, 4). Stewart Isl. (LACM 45863, 1; ANSP 263374, 2). Stewart Isl., Ocean Beach (DMNH 027820, 4; AMNH 141079, 1). Stewart Isl., Patterson Inlet (AMNH 105535, 2). Stewart Isl., Harrold's Bay, Beach Isl. (AMNH 126333, 1; AMNH 126332). Stewart Isl., Ringa Ringa (AMNH 126334, 1). Stewart Isl., Horseshoue Bay (ANSP 231941, 1). Stewart Isl., Ocean Beach (ANSP 232279, 5). Chatham Isl. (AMNH 183966, 1; AMNH 23094, 4). Chatham Isl., Kaingaroa (ANSP 250828, 2). Chatham Isl., Waitangi (SBMNH 6180, 1). Chatham Isl., Red Bay (DMNH 026452, 2). Campbell Isl. Monument Harbour (DMNH 027398, 4). Campbell Isl., Monument Harbor (AMNH 183965, 1; AMNH 84996, 1). Campbell Isl., Perseverance Harbor (ANSP 235404, 3). Auckland Isl. (BMNH 1905.11.28.228, 1). Auckland Isl., Enderby Isl., Derry Castle Reef (SBMNH no #, 6).

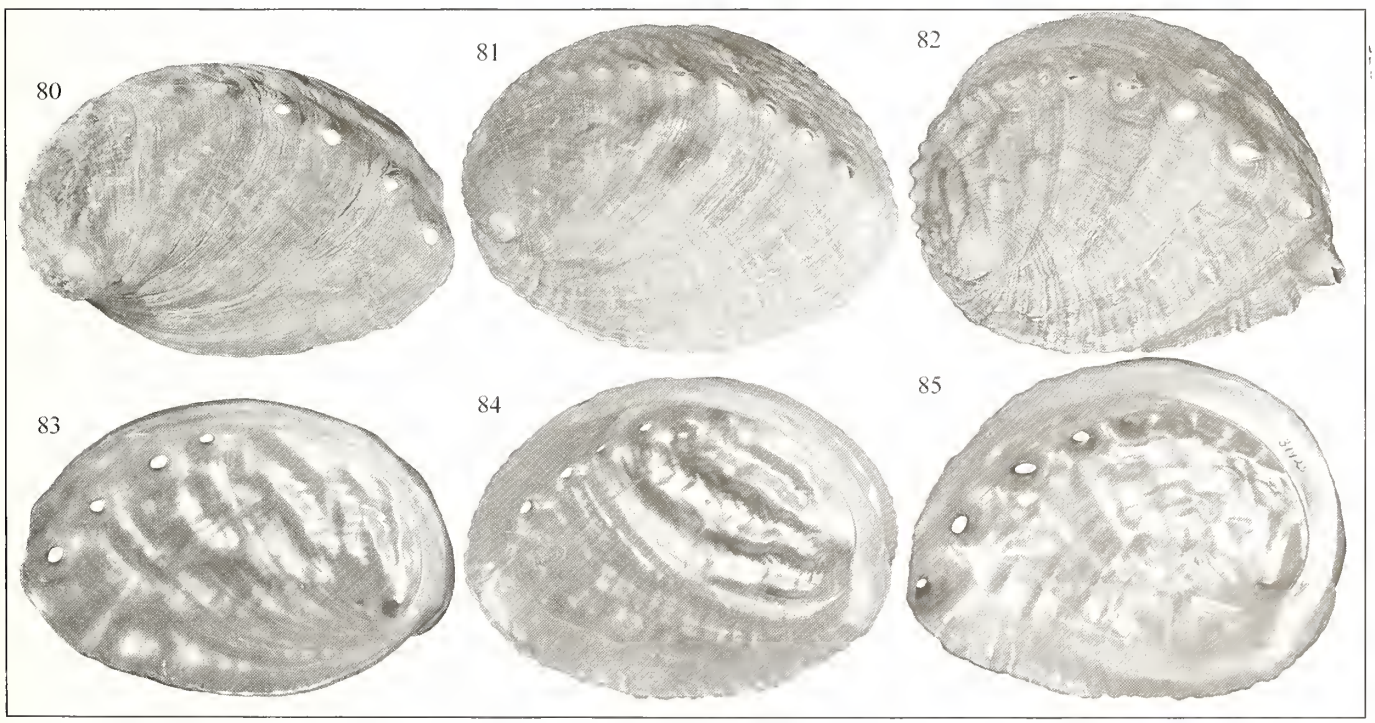
LITERATURE, LOCALITIES: N Isl., Tutukaka; Mercury Bay; Takapuna; Matapouri; Chatham Isl., Waitangi; Owenga (UBALDI, 1986).

LITERATURE, RANGE: New Zealand, Chatham, Stewart, Kermadec Isl., Campbell Isl. (SUTER, 1913). E coast of North Isl. to Hauraki Gulf; Cook Strait Area; S most South Isl. - Stewart Isl.; Auckland Isl.; Campbell Isl.; Chatham Isl. (UBALDI, 1986).

Northwest Pacific Species (Figs. 80-86, 118, 121)

Haliotis discus Reeve, 1846 (Figs. 80, 83, 86)

USSR: Kurilen, Moneron Isl. (DLG AAB 03c, 2). CHINA: Tsingtao Sung (USNM 404389, 3). JAPAN: Hokkaido, Teshio Prov., Yagishiri Isl. (USNM 471854, 15). Hokkaido, Montebetsu (DLG AAB 03b, 1). Hokkaido, Hiyama, Tomari Village, Nakayama Saki (LACM 78-14, 7). Hokkaido, Hiyama, Tomari (LACM 78-9, 2; LACM 78-8, 2). Hokkaido, Nemuro, Nemuri (AMNH 80433, 1). Hokkaido, Geshio, Mashike (AMNH 19789, 5). Hokkaido, Geshio, Mashike, Teshiwo (ANSP 80391, 1; USNM 273417, 2). Hokkaido, Oshima, Hakodate (ANSP 219611, 1; MNHN no #, 1). Hokkaido, Abashiri (ANSP 252615, 6; ANSP uncataloged, 1). Hokkaido, Ishikari, Otaru (USNM 22683, 4). Honshu, Wakayama, Mio (AMNH 239003, 2; ANSP uncataloged, 1). Honshu, Wakayama, Seto Marine Laboratory, Cape Bansho-zaki (LACM 82-19, 3). Honshu, Wakayama, Shirahama, Kii (LACM 110919, 2; AMNH 260666). Honshu, Wakayama, Shirahama, Kii, Kii Channel (AMNH Edison A9853, 2). Honshu, Niigota, Sado Isl., Aikawa Machi, Samuto Saki, Seki (ANSP 325476, 3). Honshu, Niigota, Sado Isl., Aikawa, Riuzen (USNM 205829,



Figs. 80-85. Shells of the northwest Pacific abalone. Figs. 80, 83. *Haliotis discus* Reeve, 1846. DLG AAB 03b. Montebetsu, Hokkaido, Japan. 82 mm. Figs. 81, 84. *Haliotis gigantea* Gmelin, 1791. DLG AAB 27c. Nada, Wakayama Preference, Japan. 75 mm. Figs. 82, 85. *Haliotis madaka* Habe, 1977. LACM 31925. Japan. Cate coll. 163 mm.

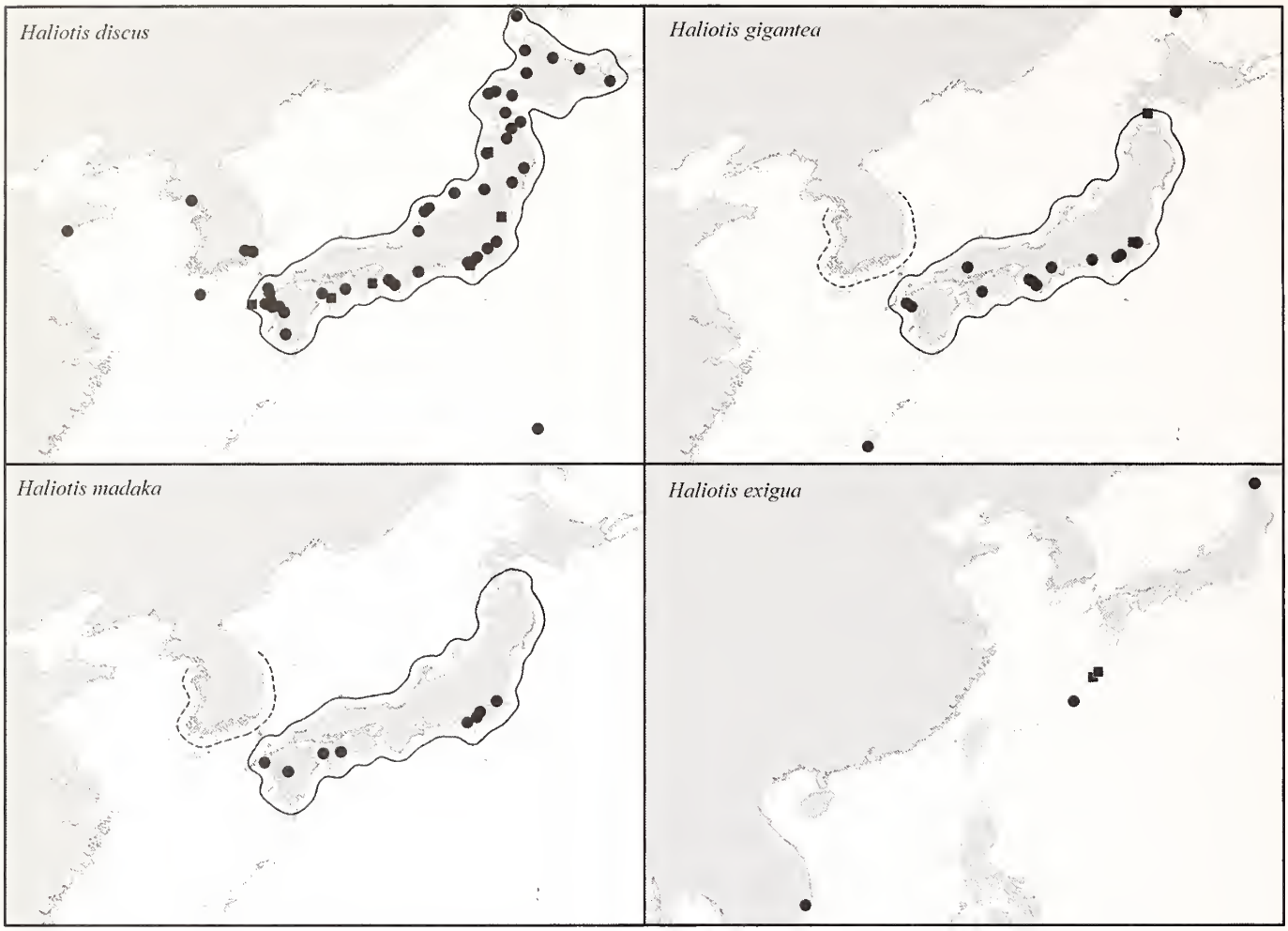


Fig. 86 - Distribution of northwest Pacific species of *Haliotis* spp. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

1). Honshu, Noto (AMNH 80443, 1; AMNH 141071, 1). Honshu, Noto, Monzen-fukami (LACM 82-5). Honshu, Amori (AMNH 173245, 1; MNHN no #, 2). Honshu, Amori, Cape Shiriyazaki (LACM 78-15, 2; LACM 82-17, 3). Honshu, Amori, Asamushi Marine Biological Station, Mutsu Bay (LACM 82-16, 4; LACM 87-12, 2 + 3 wirh dried bodies). Honshu, Akita, Funagawa [= Funakawa ?] (USNM 226857, 4). Honshu, Iwate, Rikuzen (LACM 59342, 1; USNM 343822, 2). Honshu, Iwate, Fukura, Awaji (ANSP 76327, 1). Honshu, Miyagi (ANSP 241102, 2). Honshu, Kanagawa, Sagami Bay (AMNH Edison A9853, 2; SBMNH no #, 2). Honshu, Kanagawa, Yokohama (USNM 43065, 4). Honshu, Ishika, Mikawa (AMNH Edison A9853, 1). Honshu, Chiba, Station Boshu (LACM 120226, 1). Honshu, Chiba, Boso Peninsula, Karsu-ura (USNM 753692, 2). Honshu, Shizoaka, Matsuzaki (ANSP 252589, 6). Honshu, Mie (ANSP 252583, 2). Shikoku, Ehime, Misaki (ANSP 119840, 13). Shikoku, Kochi, Tosa (LACM 91286, 2; LACM 91275, 1). Off Shikoku, Iki-suido (SBMNH 6172, 1). Kyushu, Ka(g)oshima (AMNH 115319, 1). Kyushu, Kumamoto, Amakusa Marine Laboratory (LACM 82-27, 11). Kyushu, Kumamoto, Amakusa Marine Laborarory, Tsujushima Isl. (LACM 82-25, 2). Kyushu, Kumamoto, Amakusa Marine Laborarory, S Tamioka Peninsula (LACM 82-26, 1). Kyushy, Nagasaki, Sasebo, Shrahama Beach Cove (AMNH 272136, 1). Kyushu, Nagasaki, Kuchinotsu (AMNH 241418, 6). Kyushu, Nagasaki, Nagasaki (NHB 1711-b, 1). Kyushu, Nagasaki, Marsushima Bay (ANSP uncataloged, 1). Kyushu, Nagasaki, Enoshima (AMNH 46574, 1). Kyushu, Saga, Takashima (USNM 226852, 1). Bonin Isl. (= Ogasawara-shoto) (USNM 226853, 1). KOREA: Korea Strait, Cheju-do (= Quelpart Isl.) (ANSP 298275, 3; LACM 71-256). Pusan (DMNH 011046, 5; AMNH 198669, 1). Masan, Kyongsong Namdo (USNM 623631, 1). Off Inchon, Paenr Myong Do (USNM 673371, 2).

LITERATURE: LOCALITIES: S[h]imoda; Hakodate; Goto Isl. (PILSBRY, 1895). Ibaragi, Otsu, 180 miles N of Tokyo (INO & HARADA, 1961). Honshu, Akira, Oga; Kyushu, Ehime, Uwajima; Kyushu, Tokushima, Anan (ARAI *et al.*, 1982).

LITERATURE: RANGE: N Japan; Honshu rhrough S Kyushu (KIRA, 1962).

Haliotis exigua **Dunker, 1877 (Figs. 87, 118, 121)**

JAPAN: Hokkaido, Oshima, Hakodadi [= Hakodate ?] Bay (USNM 1652, 1). Okinawa (LACM 45851, 1; LACM 45847,

1). Okinawa, Camp Kue, W Nakagami-Gun (USNM 670615, 1). Okinawa, Onna Village (USNM 821324, 2). Okinawa, Onna Village, Horseshoe Cliffs (USNM 838974, 16; USNM 838847, 1). Okinawa, Kadena Yacht Club, sea wall at channel (USNM 821168, 3; USNM 821128, 1). Okinawa, Machinato Reef (SBMNH no #, 1; SBMNH no #, 2). Okinawa, Kouri-jima (SBMNH no #, 3). Okinawa, Imbu (SBMNH no #, 2; SBMNH no #, 5). VIETNAM: Nha Trang Bay, Hon Lo Isl. (DLG AAB 54a, 3).

LITERATURE, LOCALITIES: Kagoshima, Amami Isl.; Kagoshima, Amami Isl., Setouchi; Kagoshima, Kakeroma Isl., Shodon Bay (ARAI *et al.*, 1988: as *H. planata*).

LITERATURE, RANGE: Okinawa (TALMADGE, 1963).

Haliotis gigantea Gmelin, 1791 (Figs. 81, 84, 86)

RUSSIA: Sakahalin Isl. (LACM 31490, 1). JAPAN: Honshu, Wakayama, Shirahama, Kii (LACM 110815, 2; DMNH 049414, 1). Honshu, Wakayama, Minabe (AMNH 239002, 4). Honshu, Wakayama, near Seto Marine Laboratory, Cape Bansho Zaki (LACM 82-19, 2). Honshu, Miura Pensinsula, Misaki (Entrance to Tokyo Harbor) (USNM 753693, 2). Honshu, Kanagawa, Sagami Bay (AMNH 220241, 1; SBMNH no #, 1). Sagami (USNM 228275, 1). Honshu, Kanagawa, between Tokyo and Sagami Bay, Misaki (AMNH 120582, 1). Honshu, Chiba, Station Boshu (LACM 129224, 1). Honshu, Chiba, Katsuura (LACM A.8487.68, 1; SBMNH no #, 1). Honshu, Shizuoka, Matsuzaki (ANSP 252588, 4). Honshu, Mie (ANSP uncataloged, 1). Honshu, Hiroshima (SBMNH no #, 1). Shikoku, Kochi, Tosa (ANSP 192975, 2). Shikoku, Kochi (= Tosa), Oinoshima (DMNH 011026, 1; DMNH 008698, 4). Kyushu, Nagasaki, Nagasaki (NHB 1711-b). Kyushu, Nagasaki, E[n]oshima (LACM 120220, 2; LACM A.2777a, 2). Kyushu, Nagasaki, E[n]oshima, Market (LACM 120228, 1). Okinawa, Ishinone, Izu (ANSP 219613, 1). PALAU (= BELAU): (USNM 589521, 1: doubtful).

LITERATURE, LOCALITIES: Yedo (= Tokyo); Hakodate (PILSBRY, 1895).

LITERATURE, RANGE: Honshu - S Kyushu (KIRA, 1962: as *sieboldii*). Kyushu Isl.; Shikoku Isl.; S Honshu - Boso Peninsula; S Korea (HABE & KOSUGE, 1964).

Haliotis madaka Habe, 1977 (Figs. 82, 85, 86)

JAPAN: Honshu, Chiba, Station Bonshu (LACM 112927, 1 + 3 dried radulae). Honshu, Kanagawa, Sagami (LACM 119068, 1; USNM ex 228275, 1). Honshu, Shizuoka, Matsuzakim (ANSP 399931, 1). Honshu, Kurihama, Miura Peninsula, entrance of Tokyo Bay, Kii (USNM 753694, 1). Shikoku, Ehime, Misaki (ANSP 252573, 2). Shikoku, Okinoshima, Tosa (DMNH 011021, 2; DMNH 008706, 1). Kyushu, Nagasaki, Market of Enoshima (LACM 120227, 3). Kyushu, Kumamoto, Amakusa Marine Laboratory (LACM 82-27, 9).

LITERATURE: RANGE: Honshu - S Kyushu (KIRA, 1962: as *gigantea*). Japan, Korea (ABBOTT & DANCE, 1983: as *gigantea*).

East Pacific Species (Figs. 87-102, 104-107, 109, 110, 112, 113, 167, 168, 173)

Haliotis corrugata Wood, 1828 (Figs. 88, 91, 100)

CANADA: British Columbia, Victoria, Breakwater (AMNH 249114, 1 [?]). CALIFORNIA: San Francisco County, San Francisco, Farallon Isl. (DMNH 111164, 1; DMNH 111165, 1). San Francisco County, Rocky Point (AMNH 198682, 1). Monterey County, Monterey Peninsula (SBMNH 1919, 1). San Luis Obispo County, Moro Bay (DMNH 066221, 1; DMNH 095516, 1). San Luis Obispo County, Cambria (SBMNH 229, 2). Santa Barbara County, Santa Barbara (DMNH 118926, 1; 136735, 1). Santa Barbara County, Point Conception (LACM 63-39.8, 3). Santa Barbara County, Coal Oil Point, Goleta (SBMNH 23446, 5). Santa Barbara County, Coal Oil Point, Isla Vista (SBMNH 25528, 1). S Anacapa Isl. (LACM 64-28.6, 1). Anacapa Isl. (SBMNH 44473, 2; SBMNH 44470N, 2). Anacapa Isl., ocean side (SBMNH 44471, 2). Santa Barbara County, Santa Rosa Isl. (SBMNH 170, 3). Santa Barbara County, Santa Cruz Isl. (LACM 69-32.7, 2; LACM 40-163.4, 1). Santa Barbara County, W Santa Cruz Isl. (SBMNH 6153, 1). Santa Barbara County, N Santa Cruz Isl. (LACM 63-5.6, 1; AMNH 198771, 1). Santa Barbara County, Santa Cruz Isl., Smuggler's Cove (LACM 48-42.11, 3; SBMNH 44469, 2). Santa Barbara County, S Santa Cruz Isl., N Gull Isl. (LACM 73-11.9, 4). San Clemente Isl., near Pyramid Cove, Hores Cove (LACM 39-129.5, 1). San Clemente Isl. (LACM 146745, 1; LACM 23453, 2). SE San Clemente Isl. (LACM 20951, 1). San Clemente Isl., Wilson Cove (LACM 66-51.6, 2). SE Santa Clemente Isl. (LACM 69-29.12, 8). Santa Barbara County, Santa Barbara (BMNH 1822, 1). Santa Barbara County, Santa Barbara Isl. (LACM 72-97.8, 2). Santa Barbara County, 10 miles off Santa Barbara Isl. (SBMNH 18825a, 2). Santa Barbara County, San Miguel Isl. (USNM 778933, 1). Channel Isl., Cortes Bank, near Bishop Rock (LACM 71-206.3, 1; LACM 69-34, 4: complete). Ventura County, Port Hueme (AMNH 111142, 1). Ventura County, Marina Oxnard, Channel Isl. (SBMNH 178, 1). Ventura County, N San Nicolas Isl. (LACM 72-101.8, 2; LACM 68-35.6, 1). Ventura County, NE San Nicolas Isl. (LACM 69-15.7, 1). Ventura County, S San Nicolas Isl. (LACM 69-14.5, 1). Los Angeles County, Santa Catalina Isl., Isthmus Cove (LACM 71-99.12, 3). Los Angeles County, Santa Catalina Isl., Farnsworth Bank (LACM 65-32.4, 2). Los Angeles County, Santa Catalina Isl., N Avalon (LACM 62-5.7, 1). Los Angeles County, W Santa Catalina Isl. (LACM 64-26.8, 4; LACM 68-25.5, 2). Los Angeles County, W Santa Catalina, Ironbound Cove (LACM 69-31.7, 1). Los Angeles County, Santa Catalina Isl. (DMNH 066025, 2). Los Angeles County, Santa Catalina Isl., USC lab (USNM 784077, 2). Los Angeles County, S Santa Catalina Isl., E of Isthmus (LACM 67-11.6, 2). Los Angeles County, Point Dume (AMNH 198676, 1). Los Angeles County, N Malibu (AMNH 240630, 1). Los Angeles County, Malibu (SBMNH no #, 1). Los Angeles County, Redondo Beach (LACM 146743, 5). Los Angeles County, Los Angeles, Palos Verdes (DMNH 111166, 1). Los Angeles County, Palos Verdes, Whites Point (LACM 59328, 1; AMNH 111940, 1). Los Angeles County, Palos Verdes, Portuguese Bend (LACM

146748, 1; LACM 146738, 1). Los Angeles County, Paradise Cove (LACM 66-58.5, 1; AMNH 93406, 1). Los Angeles County, Los Angeles, San Pedro (DMNH 136735, 1; DMNH 066013, 1). Orange County, Laguna Beach (MHNG 21808, 1). Orange County, S Laguna Beach (AMNH Edison A9853, 2). Orange County, between Newport Beach and Laguna (USNM 524678, 2). San Diego County, Point Loma (LACM 72-111.6, 1; AMNH Jackson 1992 A9873, 2). San Diego County, La Jolla (DMNH 111972, 1; LACM 67-24.5, 1). San Diego County, San Diego, Mission Bay (LACM 62-3.6, 1; LACM 71-101.2, 1). San Diego County, San Diego (AMNH 100818, 1). MEXICO: Sonora, Guyamas (DMNH 101967, 4; AMNH 123807, 2). NW Guadalupe, Poloto Roca (LACM 72-121.4, 1). Guadalupe, Inner Isl., Melpomene Cove (LACM 49-155.6, 1). SW Guadalupe, Five Fathom Bank and Basalt Arches, Isla Afuera, Ila Adentro (LACM 72-120.4, 7). W Guadalupe (LACM 65-41.2, 2). S Guadalupe (LACM 65-42.6, 3). MEXICO, BAJA CALIFORNIA, PACIFIC SIDE: Middle Coronado Isl. (LACM 63-41.10, 6). Coronado Isl. (LACM 71-98.5, 1). S Punta Pequena (LACM 71-179.2, 1; LACM 71-181.5, 1). Punta Pequena (LACM 71-6.2, 1). Todas Santos Bay (AMNH 47262, 4; ANSP 50144, 3). Todos Santos Bay, N Punta Banda, Between Black Rock Blufff and Red Earth Bluff (SBMNH 13344, 1). Punta Abreojos (LACM 71-3.8, 5). Punta San Eugenia (LACM 41-40.10, 1: complete). S Puerto Santo Tomas (LACM 66-1.4, 1). Santa Tomas (SBMNH 5672, 2). S Punta Banda (LACM 67-53.1, 1 with dried body; LACM 63-42.6, 4 bodies). S of Todos Santos, Punta Banta (DMNH 053918, 1; LACM 146751, 2). NE to E Isla Todos Santos (LACM 67-45.8, 1 + 2 with dried bodies). SW Isla Natividad (LACM 72-117.8, 5; LACM 71-165.5, 4). S Isla Natividad (LACM 72-116.4, 3). San Martin Isl. (USNM 601642, 1). N Isla San Geronimo (LACM 67-62.5, 8). S Isla San Geronimo, Sacramento Reef (LACM 71-91.8). Islas San Benito, San Benito del Oeste (LACM 146753, 1; 72-118.9, 2). Tres Benitos Isl. (AMNH 183129, 1; AMNH 254127, 1). Cedros Isl. (USNM 264495, 1). E Isla Cedros, Pueblo de Cedros (LACM 71-92.7, 1). Off SE Isla Cedro, Five Fathom Bank (LACM 71-93.7, 2). SW Isla Cedros, S Piedra Colorada (LACM 72-115.6, 2). NE Isla Cedros (LACM 72-113.6, 5; LACM 71-151.9, 14). Punta Rompiente (LACM 71-161.6, 3). Thurloe Head (LACM 71-170.1, 3). Bahia San Bartolome (= Turtel Bay) (LACM 146750, 10; AMNH 77712, 2). Isla Asuncion (LACM 67-66.10, 8). Punta San Pablo (LACM 71-178.12, 3). Bahia Magdalena, NW Punta Bercher, Isla Santa Magdalena (LACM 67-70.2, 14). Bahia Magdalena, Man of War Cove (LACM 71-183.8, 1). N Bahia Magdalena, Sail Rock, E Punta Entrada (LACM 71-14.14, 1).

LITERATURE, LOCALITIES: All Channel Islands (Cox, 1960). Bahia Tortugas (Muñoz-López, 1976).

LITERATURE, RANGE: Montery - San Quentin Bay (Oldroyd, 1927; Bonnot, 1948). Monterey (California) - Lower California (Abbott, 1954). Point Conception - Turtle Bay (Cox, 1960). Point Conception - Central Baja California (Lindner, 1975). Point Conception - Ascuncion Isl. (McLean, 1978). Point Conception - Santa Maria Bay; Channel Islands; Guadalupe Isl. (Haaker *et al.*, 1986).

Haliotis cracherodii Leach, 1814 (Figs. 89, 92, 100)

CALIFORNIA: Del Norte County, Crescent City (USNM 104142a, 3). Mendocino County, near Albion, Cormorant Cove (LACM 49-4.7, 1). San Francisco County, San Francisco (USNM 4266, 1). San Francisco County, San Purissima (USNM 98321, 1). Monterey County, Pacific Grove (USNM 664043, 1). Monterey County, Pacific Grove, near Lucas Point, DMNNH 035477, 2). Monterey County, Pacific Grove, Asilomar State Park (DMNH 120828, 11). Pacific Grove, 17 miles Fan Shell Beach (SBMNH 27121, 1). Monterey County, Monterey (DMNH 049704, 1; ANSP 50163, 2). Monterey County, Monterey, Sand Dollar Beach (DMNH 112596, 1). Monterey County, Monterey, Pacific Grove (DMNH 111169, 6; LACM 59-12.7, 13). Monterey County, Carmel (DMNH 122144, 1; ANSP 155145, 1). Monterey County, Carmel Point (LACM 79-114.2, 3; USNM 812885, 1: complete). Monterey County, Carmel, Mission Point (SBMNH no #, 3). Monterey County, N Point Sur Lighthouse (LACM 69-38.1, 1). Sonoma County, Russian River (LACM 48-47.1, 1). Marin County, Moro Bay, Horseshoe Cove (LACM 146754, 1). San Luis Obispo County, San Simeon Bay (USNM 212719, 4). San Luis Obispo County, Cambria (AMNH 85473, 4; SBMNH 219, 7). San Luis Obispo County, W Cayucos Creek (LACM 77-112.3, 1). San Luis Obispo County, Cayucos (LACM 29567, 1; LACM 146765, 1). San Luis Obispo County, Cayucos, Garcia Ranch (SBMNH 46551, 1). San Luis Obispo County, Avila Beach (LACM 68-37.7, 6). San Luis Obispo County, N Shell Beach (LACM 77-111.2, 2). San Luis Obispo County, San Luis Obispo (USNM 4258, 1). San Luis Obispo County, S Shell Beach, Dinosaur Cave (LACM 68-36.5, 1). San Luis Obispo County, Pismo Beach (ANSP 187052, 1). San Luis Obispo County, N Piedros Blancas Point (DMNH 090273, 1; LACM 76-12.3, 2: complete). San Luis Obispo County, Moro Bay (DMNH 095738, 1; DMNH 095519, 1). San Mateo County, Franklin Point (LACM 62-8.5, 1). Santa Cruz County, Grayhound Rock to Ano Neuvo Point, Waddell Beach (LACM 67-95.8, 5). Santa Barbara County, S Point Sal State Beach (LACM 77-31.2, 1). Santa Barbara County, E Carpenteria State Beach (LACM 77-30.4, 1). Santa Barbara County, Point Conception (LACM 110443, 2; LACM 88-131). Santa Barbara County, Jamala (SBMNH 46519, 1). Santa Barbara County, Goleta, Coal Oil Point (SBMNH 232, 1; SBMNH 23445, 4). Santa Barbara County, Santa Cruz Isl. (DMNH 090277, 1; LACM 40-163.5, 3). Santa Barbara County, S Santa Cruz Isl., Willow anchorage (LACM 40-167.8, 1 body; LACM 40-167.9, 1). Santa Barbara County, Santa Cruz Isl., Fourneys Cove (LACM 69-11.3, 3; SBMNH 19137, 1). Santa Barbara County, Santa Cruz Isl., SW Smugglers Cove (LACM 48-42.12, 1). Santa Barbara County, Santa Cruz Isl., Pelican Bay (USNM 682092, 3). Santa Barbara County, Santa Cruz Isl., Arch Rock (SBMNH 28304, 2). Santa Barbara County, Santa Barbara Isl. (ANSP 155137, 1; 50538, 3). Santa Barbara County, San Miguel Isl. (LACM 67-38.7, 4; ANSP 239564, 2). Santa Barbara County, San Miguel Isl., Tyler Bight (LACM 38-151.1, 1; LACM 38-151.1, 1). Santa Barbara County, Santa Rosa Isl. (AMNH 198673, 1; USNM 60296, 3). Ventura County, Point Mugu (LACM 146777, 1; LACM

146783, 1). Ventura County, Oxnard Marina (SBMNH 221, 5). Ventura County, Point Hueme (SBMNH 44392M, 1). Ventura County, Point Dume (DMNH 035329, 3). Ventura County, San Nicolas Isl. (DMNH 174760, 11; LACM 59322, 5). Ventura County, San Nicolas Isl., Honey Moon Cove (LACM 146781, 3). Ventura County, San Nicolas Isl., Dutch Harbor (SBMNH no #, 2). Los Angeles County, Santa Catalina Isl. (LACM 146766, 1: complete). Los Angeles County, Santa Catalina Isl., Fisherman's Cove (LACM 146782, 5). Los Angeles County, W Santa Catalina Isl. (LACM 64-26.9, 1; LACM 68-25.6, 1). Los Angeles County, Santa Catalina Isl., NW Fouth of July Cove (LACM 52-14.3, 1: complete). Los Angeles County, SW Santa Catalina Isl., Ironbound Cove (LACM 69-31.8, 1). Los Angeles County, Santa Catalina Isl., Cherry Cove, W Isthmus Cove (LACM 48-15.5, 2). Los Angeles County, Santa Catalina Isl., Isthmus Cove (LACM 71-213.2, 2; LACM 71-99.13, 4). Los Angeles County, Santa Catalina Isl., Avalon (SBMNH 48, 4). Anacapa Isl. (LACM 146774, 2; USNM 778883, 2). San Clemente Isl. (LACM 39-125.2, 2; AMNH 93906, 1). San Clemente Isl., China Point (LACM 39-2.2, 1). San Clemente Isl.,Wilson Cove (LACM 66-51.7, 1). San Clemente Isl., NW Harbor (LACM 39-125.2, 5). San Clemente Isl., Pyramid Cove (LACM 39-128.3, 1: complete). San Clemente Isl., near Pyramid Cove, Horse Cove (LACM 39-129.6, 1; LACM 39-129.6, 5: complete). Los Angeles County, Leo Carillo State Park, Sequit Point (LACM 62-23.2, 1). Los Angeles County, Malibu (LACM 61972, 4; LACM 54786, 3: complete). Los Angeles County, Topanga Creek (LACM 68-192.4, 1). Los Angeles County, Redondo (USNM 199890, 1; SBMNH no #, 2).

LOS ANGELES COUNTY, PALOS VERDES PENINSULA: Torrence, Flat Point (DLG AAB 37e, 1). Torrence, Algal Cove (DLG AAB 37g, 1). Lunada Bay (LACM 60-13.7, 1). Bluff Cove (LACM 46-32.8, 1: complete; LACM 146760, 2). Point Vincente (LACM 61-10.4, 6; LACM 146764, 1). Portuguese Bend (LACM 65-80.5, 6; LACM 54781, 1: complete). Flatrock Point (LACM 10911, 5). White's Point (DMNH 121423, 20; DMNH 008702, 3). Malaga Cove (DMNH 113801, 8; ANSP 263045, 2). Clayden Drive (DMNH 074540, 2). 2 miles N of Marine Land (DMNH 108687, 2). Reef Point (AMNH 183127, 1). Los Angeles County, Point Vincente (USNM 120131, 2). Los Angeles County, San Pedro (LACM 18748, 1; LACM 111094, 7). Los Angeles County, Los Angeles, San Pedro, Royal Palms Beach (DMNH 0421296, 5; LACM 72-96.5, 3). Los Angeles County, San Pedro Bay (ANSP 50539, 9). Los Angeles County, Los Angeles, Point Fermin (DMNH 066023, 3; LACM 61812, 2). Orange County, Anaheim Landing (LACM 146767, 17). Orange County, Laguna Beach (DMNH 008699, 1; DMNH 136499, 8). Orange County, Newport Beach (DMNH 088024, 3, AMNH 103822, 2). Orange County, Laguna Beach (ANSP 324965, 1). Orange County, Corona del Mar (DMNH 112133, 3; BMNH 2258, 7). Orange County, Corona del Mar, Newport (LACM 69-7.2, 7; LACM 40-142.9, 1: complete). Point Loma (AMNH 84651, 1, AMNH 100827, 1). San Diego County, La Jolla (DMNH 008683, 2; AMNH 240632, 1). San Diego County, La Jolla, Devil's Slide (SBMNH no #, 1). San Diego County, La Jolla, Bird Rock (SBMNH no #, 3). San Diego County, San Diego (ANSP 50534, 5; USNM 3406, 1). San Diego County, San Diego, Mission Bay (LACM 146761, 1; LACM 68-26.4, 1). MEXICO, GUADALUPE ISL.: (DMNH 010968, 2; LACM 146799, 1). Seal Beach (DMNH 111608, 1). NW Anchorage (AMNH 198671, 1). NE anchorage (LACM 10349, 3). NW Guadalupe Isl. (LACM 19653, 2). S Bluff (LACM 49-159.6, 6). Melepomeme Cove (LACM 146789, 2). S Guadalupe Isl. (LACM 31930, 1; LACM 18045, 1). Leeward Isl. (AMNH 236683, 1). N Lee Cove (SBMNH no #, 2). MEXICO, BAJA CALIFORNIA, PACIFIC COAST: 25 miles S of Tiajuana (AMNH 114751, >50). N Coronado Isl. (SBMNH 13327, 1). S Punta Banda, Arbolito (LACM 68-40.5, 1; LACM 67-53.2, 2). Punta Banda (LACM 63-43.1, 11; SBMNH 0888, 4). N Punta Banda (LACM 63-54.5, 1). Punta Banda, Kennedy Cove (SBMNH no #, 5). NE Punta Banda, Punta Vanda Beach (SBMNH 14626, 1). N Punta Banda, between black Rock Bluff and Red Earth Bluff (SBMNH 13346, 4). Punta Banda, La Bufadora (SBMNH 1771, 10; SBMNH 40242, 16). Punta Clara, S of Rio Santo Tomas (SBMNH 17172, 1). Off San Jose Point (AMNH 121798, 1). San Quintin (DMNH 126410, 1; USNM 34496, 1). San Quintin, W of Kenton Hill (SBMNH 16119, 1). Isla San Martin, Hassler Cove (LACM 68-31.4, 3; LACM 73-2.3, 3). Isla San Martin, Hassler Cove, Boulder Rock (SBMNH 13428, 1). Guerrero Negro (DLG AAB 37b, 4). Cedros Isl. (USNM 4317, 1; USNM 264497, 6). SW Isla Cedros, S Piedra Colorada (LACM 72-115,7, 1). N Isla Cedros (LACM 51-41.4, 1). NE Isla Cedros (LACM 71-151.10, 2). Isla Cedros, S Bay (LACM 34-162.1, 1). Punta Asuncion (LACM 50-26.10, 1). Puerto Santo Tomas (LACM 64128, 1; LACM 67-2.4, 8). Punta Santo Tomas (AMNH 183128, 1; AMNH 183128, 1). N Baja, Ensenada (AMNH 284464, 1; AMNH 254126, 2). Off Ensenada Mt. (AMNH 175667, 1). SE Isla San Geronimo (LACM 67-63.1, 6; SBMNH 13523, 5). San Geronimo Isl. (SBMNH 13522, 1). N of Ensenada at K-100 (LACM 64-32.4, 1; LACM 63-53.4, 1). N of Ensenada, El Sauzal (LACM 67-94.1, 2). Ensenada (USNM 664047, 2; USNM 664048, 2). Isla Todos Santos (LACM 67-45.9, 1). Isla San Benito (LACM 146787, 1; USNM 265598, 1). Isla E San Benito (LACM 50-23.3, 4). Isla W San Benito (LACM 50-22.2, 1; LACM 59333, 1). Middle San Benito Isl. (AMNH 85676, 3). Punta Colnett (LACM 46-14.1, 2). S Natividad Isl. (SBMNH 14095, 2). Turtle Bay (USNM 2759, 2; SBMNH 18246, 6). San Bartholome Bay (USNM 265141, 1; USNM 554377, 3). S of Tijuana, El Morro and Los Gaviotas (LACM 6-18.3, 1). Off Soledad Bay (AMNH 121800, 1). Thurloe Head (LACM 71-171.2, 2; LACM 31926, 1). Punta Rompiente (LACM 71-161.7, 1; LACM 71-162.3, 7). N Magdalena Bay (SBMNH 23249, 1). MEXICO: Nayarit, Tres Maria Isl. (DMNH 112686, 1). Guyamas (AMNH Edison A9853, 2; AMNH Edison A9853, 8). Socorro Isl. (AMNH 88826, 2).

LITERATURE, LOCALITIES: California, Point Arena (BONNOT, 1930). Point Lobos State Park, Cypress Cove (BONNOT, 1948). California, Montana de Oro State Park (MINCHIN, 1975). California, Point Arguello (HAAKER *et al.*, 1995).

LITERATURE, RANGE: Coos Bay, Oregon - Santa Rosalia, Baja California (OLDROYD, 1927; BONNOT, 1948). Part of Oregon; San Francisco - San Quentin Bay; all off-shore Isl. (BARTSCH, 1940). Coos Bay, Oregon - Lower California (ABBOTT, 1954). Coos Bay, Oregon - Cape San Lucas, Baja California (COX, 1960). Mendocino County - S Baja California (MCLEAN, 1978). Mendocino County - S Baja California (HAAKER *et al.*, 1986).

Haliotis dalli **Henderson, 1915 (Figs. 107, 110, 113)**

EQUADOR, GALAPAGOS: Santa Cruz, Academy Bay (AMNH 267218, 2; AMNH Edison A9853, 1). Santa Cruz, Bahia Academy, Eocacro (LACM 146876, 1). Santa Cruz, 2 miles E of Academy Bay (LACM 72-200.7, 1). Santa Cruz, off Academy Bay (AMNH 220170, 1; SBMNH no #, 1). Santa Cruz (DMNH 106715, 1; LACM 152364, 1). S Santa Cruz (AMNH 145835, 1: in alcohol with some tissue; USNM 812778, 1). Isla Floreana, Isla Onslow (LACM 30144, 1 body). Isla San Salvador, *ex pisce* (AMNH 139043, 1). San Salvador, Bahia James (LACM 34-273.7, 1; SBMNH no #, 1). San Salvador, 1 mile W of Bahia James (LACM 66-210.14, 1). Baltra Isl. (AMNH 156380, 1). Fernandina, Punta Espinosa (LACM 152363, 3; LACM 72-197.1, 2). Espagnola, Bahia Gardner (LACM 34-78, 10). Isabella, Punta Albemarle (LACM 11732, 1). Santa Maria, 0.5 miles S of Playa Negro (LACM 34-300.3, 1). Santa Maria, NW of Bahia Post Office (LACM 34-72.2, 1). Isabella, Caleta Tabus (LACM 34-20.12, 1; LACM 34-21.9, 1). COLOMBIA: N of Isla Gorgona (LACM 38-119.5, 1 + 1: complete)

LITERATURE, LOCALITIES: Charles Isl. (DALL, 1889: as *H.pourtalesii* ?).

LITERATURE, RANGE: Gorgona Isl., Colombia; Galapagos Isl. (MCLEAN, 1971). Galapagos, W Colombia (ABBOTT & DANCE, 1983). Gorgona Isl. - Galapagos (FINET, 1993).

Haliotis fulgens **Philippi, 1845 (Figs. 90, 93, 100)**

WASHINGTON: Straits of Juan de Fuca (AMNH Edison A9853, 1 [?]). CALIFORNIA: San Luis Obispo County, Moro Bay (DMNH 095515, 1). San Luis Obispo County, Oceano (DMNH 095520, 1). San Luis Obipo County, near Cambria, Leffingwell Landing (LACM 47-7.2, 1). Santa Barbara County, N Point Conception (AMNH Edison A9853, 4). Santa Barbara County, Santa Barbara (LACM 146806, 1). Santa Barbara County, Goleta (DMNH 090340, 1; AMNH Edison A9853, 1). Santa Barbara County, Coal Oil Point (SBMNH 23448, 5). Santa Barbara County, Santa Cruz Isl. (LACM 40-163.6, 1: complete; AMNH Edison A9853, 1). Santa Barbara County, N Santa Cruz Isl. (SBMNH 12589, 1). Santa Barbara County, Santa Cruz Isl., Smuggler's Cove (SBMNH 28302, 1). Santa Barbara County, Santa Rosa Isl. (ANSP 50151, 1; USNM 73589, 2). Ventura County, Point Mugu N.A.S (AMNH 254136, 5). Los Angeles County, Santa Catalina Isl., Isthmus Cove (LACM 71-99.14, 3). Los Angeles County, Santa Catalina Isl., Ironbound Cove (LACM 69-31.9, 3). Los Angeles County, Santa Catalina Isl., N Avalon (LACM 62-5.8, 2). Los Angeles County, Santa Catalina Isl., Catalina Harbor (LACM 146805, 2). Los Angeles County, W Santa Catalina Isl. (LACM 68-25.7, 3; LACM 146812, 1). San Clemente Isl. (AMNH 100803, 1; AMNH 220184, 2). SE San Clemente, Pyramid Point (LACM 69-29.13, 1; LACM 39-129.8, 1). SW San Clemente Isl. (AMNH 100814, 1; USNM 684686, 1). Los Angeles County, Malibu (SBMNH 28175, 1). Los Angeles County, 2 miles NE Palos Verdes (DMNH 034839, 1). Los Angeles County, Palos Verdes, Portuguese Bend (LACM 146835, 4; LACM 65-80.6, 1). Los Angeles County, off Palos Verdes Estate (DMNH 111167, 1). Los Angeles County, Palos Verdes, Flatrock Point (LACM 60-29.1, 1). Los Angeles County, Palos Verdes, Bluff Cove (LACM 31927, 1; AMNH 198679, 1). Los Angeles County, San Pedro (DMNH 066015, 1; LACM 59332, 7). Los Angeles County, Palos Verdes, Lunada Bay (LACM 60-13.8, 6; LACM 64-25.5, 2). Los Angeles County, S Redondo Beach (LACM 41-217.2, 1: with dried body; AMNH 100822, 4). Orange County, San Onofre (LACM 69-36.3, 1: with dried body). Orange County, Laguna Beach (DMNH 119863, 1; LACM 146809, 6). Orange County, Anaheim Landing (LACM 146798, 1). Orange County, Corona del Mar, S Newport Jetty (LACM 69-7.3, 1). Orange County, Newport (DMNH 066026, 1; AMNH 111941, 1). San Diego County, Pointe Loma (AMNH Jackson 1992 A9873, 3; SBMNH no #, 2). San Diego County, La Jolla (DMNH 136744, 1; LACM 54785, 1: complete). San Diego County, La Jolla, Boomer Beach (LACM 146807, 1). San Diego County, La Jolla, Devil's Slide (SBMNH 29017, 1). San Diego County, La Jolla, Bird Rock (SBMNH no #, 3; SBMNH no #, 4). San Diego County, San Diego (AMNH 100828, 6; ANSP 50511, 3). MEXICO, BAJA CALIFORNIA, PACIFIC COAST: N Coronado Isl. (SBMNH 15227, 1). SE Isla San Geronimo (LACM 67-63.2, 3; SBMNH 13524, 1). E Isla San Martin, Hassler Cove (LACM 68-31.5, 2). San Quentin Bay (USNM 34497, 1). N Baja, S of San Quintin, El Consuelo (AMNH 254131, 1). Todas Santos Bay (ANSP 50512, 2; USNM 740978, 1). Punta Colnett (LACM 46-14.2, 3). Punta Banta (DMNH 053919, 1; SBMNH 43471, 1). S Punta Banda, Arbolito (LACM 67-44.5, 1). Punta Banda, Punta Vanda Beach (SBMNH 14627, 1). Punta Conception (SBMNH 140220, 1). 10 miles N of Ensenada (AMNH 85560, 1). Ensenada (LACM 146814, 1, AMNH 183124, 1). N Ensenada at K-100 (LACM 64-32.5, 1). Turtle Bay (= Bahia San Barolome) (LACM 146813, 3; SBMNH 18250, 2). Bahia Thurloe (LACM 146822, 6). Santa Maria Bay (USNM 2642111, 1). Punta Hughes, N Bahia Santa Maria (LACM 67-69.3, 12). E Punta Hughes, Bahia Santa Maria (LACM 67-68.2, 2). Magdalena Bay (ANSP 151204, 1; ANSP 152214, 2). Magdalena Bay, Punta Entrada (LACM 71-184.7, 2). Magdalena Bay, Magadalena Isl., S side of Hughes Point (AMNH 77554, 1). Magdalena Bay, Magdalena Isl., NE Punta Belcher (LACM 67-72.4, 1; LACM 67-70.3, 1). Magdalena Bay, Man of War Cove (LACM 71-183.9, 4). N entrance Bahia Magdalena, Sail Rock (LACM 71-14.15, 7). S Punta Pequeña (LACM 71-181.6, 3; LACM 79-25.2, 2: with bodies). NE Punta Abreojos (LACM 50-32.2, 1). Punta Abreojos (LACM 71-3.9, 1). Islas San Benito, San Benito del Este (LACM 50-23.4, 1). 20 miles E Punta Eugenia, Hancock Cove (LACM 51-45.2, 1). Islas San Benito, W Benito del

Centro (LACM 50-89.3, 5). W San Benito Isl. (USNM 264398, 4; USNM 265600, 1). Near Santa Rosalia (LACM 146816, 2). Isla Cedros, S bay landing (LACM 41-35.1, 3). NE Isla Cedros (LACM 71-151.11, 4). Islas Cedros, N Pueblo de Cedros (LACM 67-65.9, 1). E Isla Cedros, Viscaino Bay (LACM 146818, 1). Cerros Isl. (ANSP 50530, 2; USNM 6209, 1). E Isla Asuncion (LACM 67-66.11, 1). San Juanico (SBMNH 17154, 1). La Paz (USNM 533690, 3; USNM 60430, 1). Punta Rompiente (LACM 71-161.8, 1). MEXICO OTHER: Guadalupe Isl. (DMNH 066029, 1; LACM 146820, 1). N Guadalupe Isl. (SBMNH 17589, 5). S Guadalupe Isl. (AMNH Edison A9853, 1). Guadalupe Isl., Five Fathom Bank, Isla

Fig. 87 - Distribution of east Pacific *Haliotis k. kamtschatkana* Jonas, 1845. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

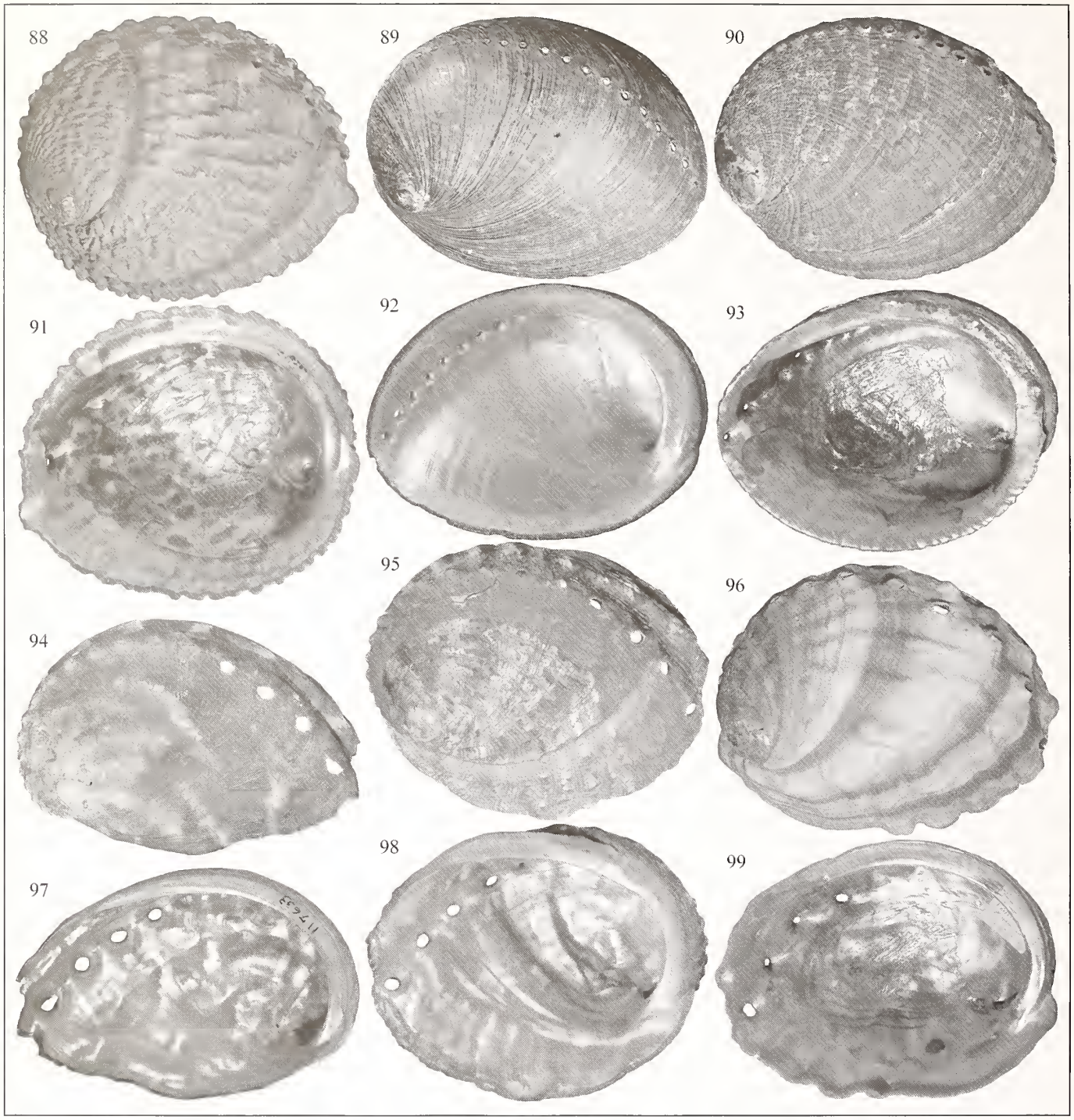
Adentro, Isla Afuera (LACM 72-120.5, 1). Guadalupe Isl., S Tip, Morro Sur (USNM 660565, 1). Guadalupe Isl., N Anchorage (SBMNH 38687, 2). Guyamas (AMNH Edison A9853, 4). Acapulco (NMBE ex 1329.1420, 1: doubtful, not mapped).

LITERATURE, LOCALITIES: Gulf, La Paz (Bartsch, 1940). Bahia Tortugas; Isla Natividad (Muñoz-López, 1976).

LITERATURE, RANGE: Monterey Bay - Lower California (Oldroyd, 1927). Farallon Isl. - Gulf of California (Bonnot, 1948). Farallon Isl. - Gulf of California (Abbott, 1954). Point Conception - Magdalena Bay (Cox, 1960; McLean, 1978; Haaker *et al.*, 1986).

***Haliotis k. kamtschatkana* Jonas, 1845 (Figs. 87, 94, 97)**

ALASKA: Ketchikan County, S Revillagigedo Isl., Ketchikan (LACM 62-200.7, 2; LACM 11737, 3). Ketchikan (AMNH 220196, 2; MNHN no #, 1). 20 miles N of Ketchikan, Behm Canal, S Cedar Isl. (AMNH 198688, 5). Ketcuikan (AMNH 173857, 1). Prince of Wales County, Craig (LACM 146827, 4; LACM 34585, 1). Prince of Wales County, Prince of Wales Isl. (LACM 146831, 2). Prince of Wales County, W Prince of Wales Isl. (AMNH 198693, 22). Kenai-Cook Inlet County, Kenai Peninsula, Cook Inlet, Kachemak Bay, W Ksitsna Bay, Kenai-Cook Inlet County, 59° 29' N 151° 37' W (USNM 894178, 1). McDonald Spit (LACM 83-104.19, 4). Fort Wrangell (USNM 777785, 5; USNM 132950, 1). Sitka County, Sitka (DMNH 112684, 1; LACM 110444, 2). Sitka County, Sitka, Berry Isl. Reef (LACM 10529, 5). Sitka County, Alexander Archipelago, Sitka Sound, Japonski Isl. (LACM 63-85.1, 1). Sitka County, Sitka Sound (LACM 146823, 2; LACM 146825, 1). Sitka County, Sitka Sound, Biorka Isl. (USNM 160556, 3; SBMNH 14166, 7). Sitka County, Baranoff Isl., Sitka Sound, Pirate Isl. (LACM 73-15.6, 6). Sitka County, Baranoff Isl. (LACM 146826, 1). Sitka County, W of Sitka, Kruzof Isl. (SBMNH 14172, 5). Noyes Isl. (AMNH 198692, 2; ANSP 252561, 1). Gravina Isl. (DMNH 112633, 2; DMNH 098712, 1). Annette Isl. (DMNH 131453, 1; ANSP 182730, 2). Annette Isl., Metlakatka (DMNH 131567, 2; AMNH 100829, 4). Kodiak Isl. (AMNH 121675, 1). Fox Isl., Unalaska Isl., Dutch Harbor (AMNH 86802, 3). Forrester Isl. (USNM 216402, 2; SBMNH 3404, 3). Dall Isl., Rose Inlet (USNM 603181, 4). CANADA, BRITISH COLUMBIA: Prince Rupert (SBMNH 14173, 2; SBMNH 14169, 8). Queen Charlotte Isl. (LACM 34278, 2; LACM 146833, 1). Queen Charlotte Isl., S end of Moresby Isl., Dolomite Narrows (LACM 66-67.2, 1). Queen Charlotte Isl., S end Moresby Isl., Rose Harbour (LACM 69-54.2, 2; LACM 69-54.1, 1 body). Queen Charlotte Isl., Kunghit Isl., Rose Harbour (LACM 146824, 2; USNM 58845, 12). Queen Charlotte Sound (SBMNH 29525, 1). Queen Charlotte Isl., Graham Isl. (ANSP 152379, 2). Queen Charlotte Isl., Langara Isl. (ANSP 152367, 1). Queen Charlotte Isl., N Lnagara Isl. (LACM 60-240.1, 1). Vancouver Isl., Victoria Breakwater (DMNH 087871, 2; AMNH 249113, 1). Vancouver Isl., SE Victoria Breakwater (LACM 66-63.2, 3; SBMNH no #, 3). Vancouver Isl., near Victoria, McNeill Bay (LACM 73-35.4, 4). Vancouver Isl., Victoria (LACM 10341, 15; SBMNH 1159, 1). Vancouver Isl., Victoria harbor (DMNH 100778, 2). Vancouver Isl., Johnstone Strait side, Seymour Narrows (LACM 73-39.2, 1). Vancouver Isl., Barkley Sound (DMNH 111993, 1; DMNH 111992, 1). Vancouver Isl., Barkley Sound, off Bauke Isl. (DMNH 111996, 1). Vancouver Isl., Barkley Sound, Broken Group, Effingham Isl. (LACM 34807, 2). Vancouver Isl., Ucluelet (AMNH 160605, 3; SBMNH no #, 1). Vancouver Isl., Nootka Sound (BMNH 55.3.4.131, 1). Vancouver, Nootka district, Nuchatlitz Inlet, Louise Bay entrance (LACM 73-38.5, 14 + 2 dried bodies). Vancouver, Nootka district, S Nuchatlitz Inlet, Louise lagoon (LACM 60-259.20, 3). Vancouver Isl., Ruppert District, Hope Isl., entrance Bull Harbor (LACM 63-28.24, 15; LACM 63-28.2, 3 bodies). Vancouver Isl., Rupert District, Kyuquot Sound, Union Isl., W White Cliff Head (LACM 60-253.11, 1). W Vancouver Isl., Alyquot [= Clayoquot ?] (USNM 60293, 8; USNM 777784, 4). Ocean Fall District, Birdswell Isl., Campbell Isl., New Bella Bella (LACM 82-44.1, 3). Calvert Isl. (AMNH 100831, 1; NHB 6593c, 3). Calvert Isl., Mouth of River's Inlet (AMNH 198687, 5). Fitz Hugh Sound (AMNH 104177, 4; AMNH 198693, 6). Mill Bank, Price Isl. (AMNH 198691, 7). WASHINGTON: San Juan Isl. (AMNH 240633, 1; USNM 85343, 2). San Juan Isl., W end Cactus Isl. (AMNH 88075, 8; AMNH 88075a, 1). San Juan Isl., Lonesume Cove (AMNH 108026, 1). Olympic Peninsula, Clallam County, Neah Bay (DMNH 112624, 1; NHB 6593d, 1). CALIFORNIA: Humboldt County, Point Delgada (LACM 71-



Figs. 88-99. Shells of the northeast Pacific abalone I. Figs. 88, 91. *Haliotis corrugata* Wood, 1828. LACM 23453. San Clemente Island, California. Leg. Dameoun Burford, XII. 1953. 151 mm. Figs. 89, 92. *Haliotis cracherodii* Leach, 1814. DLG AAB 37c. Channel Islands, California. 82 mm. Figs. 90, 93. *Haliotis fulgens* Philippi, 1845. DLG AAB 05b. San Diego, California. 168 mm. Figs. 94, 97. *Haliotis k. kamtschatkana* Jonas, 1845. LACM 117633. Vancouver Island, British Columbia. 88 mm. Figs. 95, 98. *H. kamtschatkana assimilis* Dall, 1878. DLG AAB 36b. California. 83 mm. Dorsal and ventral view of specimen with somewhat uncommon orange (dark) band near row of holes. To enhance the contrast of the orange band in black and white, the blue alpha-channel of the RGB file was used. Figs. 96, 99. *Haliotis rufescens* Swainson, 1822. DLG AAB 46d. Point Conception, California. Ex col. K. Stewart, leg. Thomas 1976. 209 mm.

107.1, 1). Mendocino County, S Shelter Cove (60 miles S of Eureka), Tolo Bank (LACM 71-106.1, 4). San Francisco County, SE Farallon Isl. (LACM 62-9.5, 16). Monterey County, Monterey Bay, off Del Monte (LACM 60-22.6, 2; LACM 64-232.1, 1: with preserved epipodium and radula). Monterey County, S Monterey (LACM 146837, 5; LACM 146838, 3). Monterey County, N San Jose Creek Beach, Carmel Submarine Canyon (LACM 60-24.13, > 50; LACM 60-24.14, 2 bodies). Monterey County, Monterey, Coastguard Breakwater (LACM 63-6.2, 3 bodies; LACM 68-30.1, 8). Monterey County, Pacific

Grove (LACM 54409, 16). Santa Cruz County, Grayhound Rock to Ano Nuevo Point, Waddell Beach (LACM 67-95.9, 2). Santa Cruz County, Santa Cruz (ANSP 219590, 2). San Luis Obispo County, between Point Buchon and Point San Luis (DMNH 095737, 2; DMNH 112620, 1). San Luis Obispo County, Moro Bay, off Point Estero (DMNH 11977, 1). San Luis Obispo County, off Cayucos (ANSP 183595, 1).

LITERATURE, LOCALITIES: Point Estero (Cox, 1960). Queen Charlotte Isl., Hippa Isl.; Louise Isl.; Lyell Isl.; Juan Perez Sound; Vancouver Isl., Clayoquot Sound; Nanoose Bay; Alert Bay; Main Coast, Johnstone Strait; Goose Isl. Group; Aristazabal Isl.; Caamano Sound; Estevan Group; Banks Isl.; Porcher Isl. (Sloan & Breen, 1988).

LITERATURE, RANGE: Sitka - Redondo (Oldroyd, 1927). S Alaska through Point Conception (Abbott, 1954). Sitka - Point Conception (Bonnot, 1948; Cox, 1960). Sitka - Monterey (Haaker *et al.*, 1986). Icy Strait, N tip of Sitka - Baja California (Sloan & Breen, 1988).

Haliotis kamtschatkana assimilis Dall, 1878 (Figs. 95, 99, 100)

WASHINGTON: San Juan County, Cactus Isl. (DLG AAB 36c, 2). CALIFORNIA: Montery County, Monterey (USNM 60297, 3; USNM 56470, 1). Montery County, S of Monterey (SBMNH no #, 1). Montery County, Carmel Bay (SBMNH 10348, 1). Monterey County, Hollister, off Coxo Point (AMNH

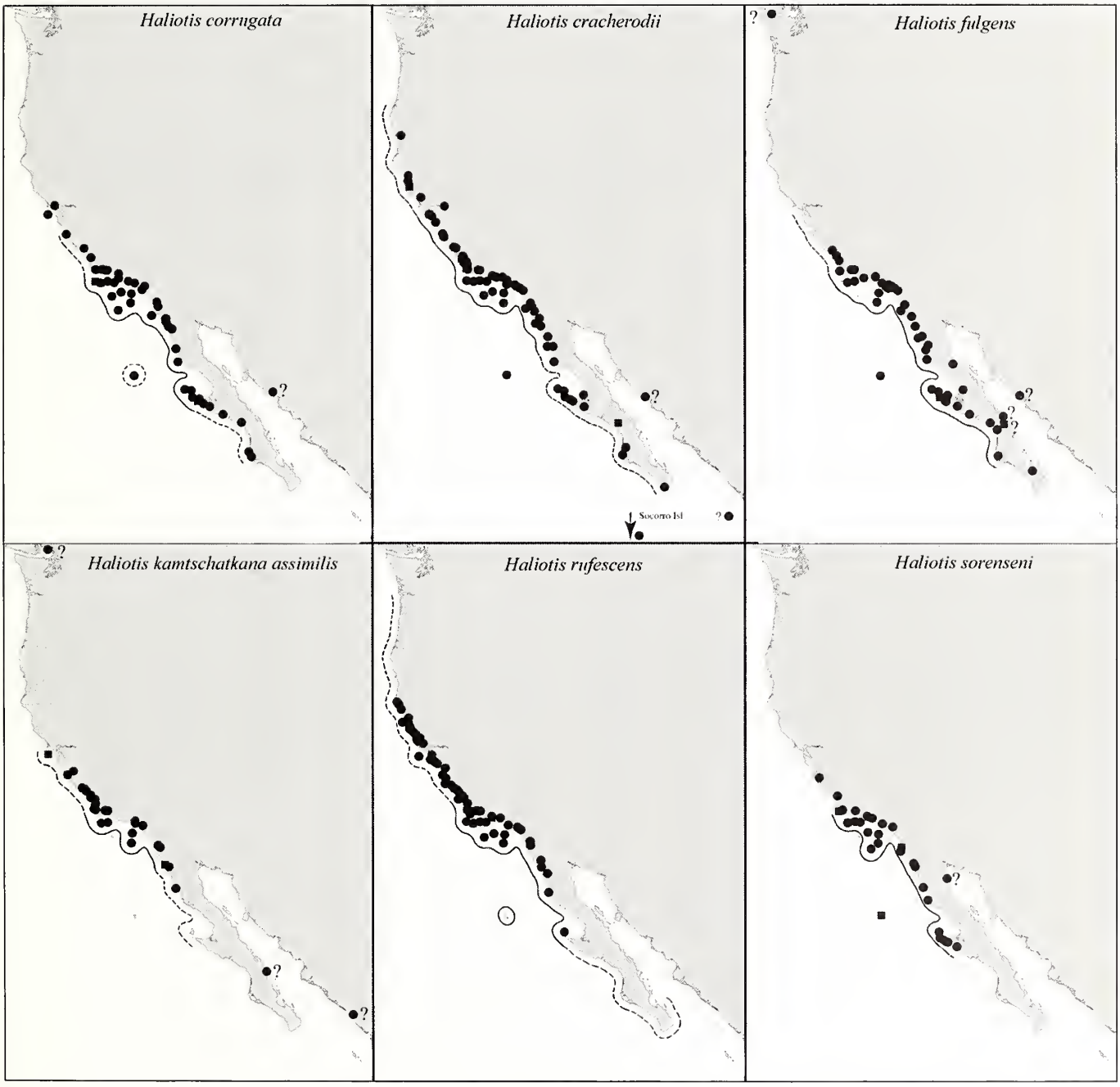
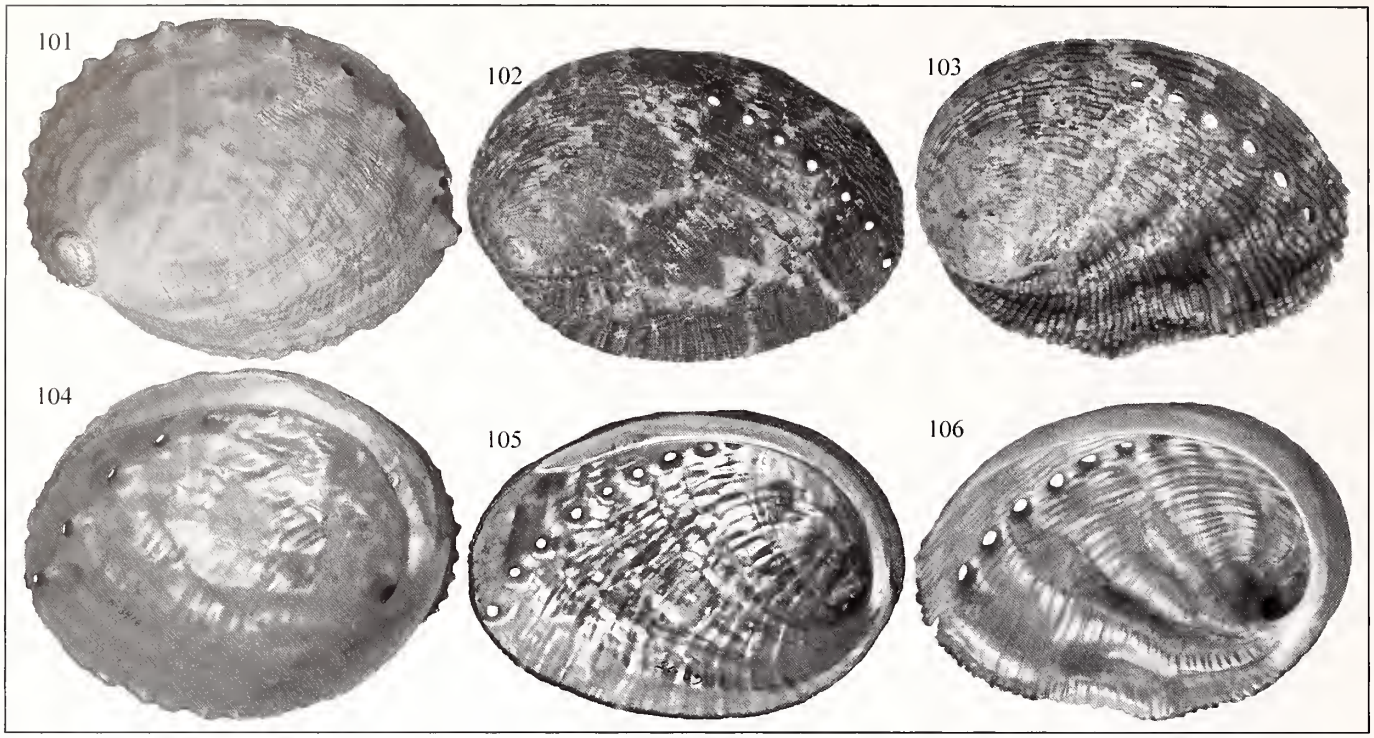


Fig. 100 - Distribution of east Pacific species of *Haliotis* spp. (I). For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.



Figs. 101-106. Shells of Northeastern Pacific abalone II, and unidentified species. Figs. 101, 104. *Haliotis sorenseni* Bartsch, 1940. LACM 146869. S. of Point Conception, California. 24. I. 1940. Ex. Huffman. 159 mm. Figs. 102, 105. *Haliotis walallensis* Stearns, 1899. LACM 62-15. Albion, Mendocino County, California. Leg. J. H. McLean 11. XI. 1962. Intertidal. 110 mm. Figs. 103, 106. *Haliotis* sp. MNHN no #. "Envoi de M. de Montigny, Consul de France à Shang Hai, Mars 1854." 52 mm. One of three very similar specimens of an unidentified species with affinities to the Australian H. rubra, but with strong folds in shell and Shang Hai locality data.

220145, 3). San Luis Obispo County, Moro Bay (DMNH 066027, 2; DMNH 095518, 1). San Luis Obispo County, 10 miles N of Moro Bay (SBMNH 22903, 2). San Luis Obispo County, off Moro Bay (LACM 45816, 1). San Luis Obispo County, Point Estero (LACM 146842, 4; LACM 146846, 4). San Luis Obispo County, Cayucos (LACM 146839, 2; AMNH 198695, 18). San Luis Obispo County, off San Simeon (LACM 146740, 2). San Luis Obispo County, Point Buchon (AMNH 115300, 2). San Luis Obispo County, S Point Buchon (LACM 146847, 5; LACM 146843, 3). San Luis Obispo County, Cambria (LACM 146849, 2). San Luis Obispo County, off Port San Luis Obispo (USNM 535850, 2). Santa Barbara County, Pt. Arguella, Rocky Point (DMNH 124214, 1). Santa Barbara County, off Jalama State Beach, between Point Conception and Point Arguella (SBMNH no #, 1). Santa Barbara County, 5 miles N of Point Conception (AMNH 198690, 1). Santa Barbara County, off Point Conception (DMNH 095623, 1; DMNH 112617, 1). Santa Barbara County, Near Point Conception, Ghost Reef (AMNH 186255, 1). Santa Barbara County, near Point Conception, Coho Anchorage (AMNH 220143, 3; ANSP uncataloged, 2). Santa Barbara County, between Coal Oil Point and Naples (SBMNH 22177, 1). Santa Barbara County, Goleta, Coal Oil Point (SBMNH 28323, 2). Santa Barbara County, Santa Barbara, Goleta (AMNH Edison A9853, 3). Santa Barbara County, N Santa Barbara (LACM 146848, 1). Santa Barbara County, Santa Rosa Isl. (AMNH 198693, 4; USNM 877517, 5). San Clemente Isl. (AMNH 220144, 7; SBMNH no #, 1). Off San Clemente Isl. (AMNH 100820, 1). Santa Barbara County, Santa Cruz Isl. (USNM 98329, 1; SBMNH 18903, 1). Los Angeles County, Redondo Beach (DMNH 111982, 1; LACM 146855, 1). Los Angeles County, Hermosa Beach (LACM 146850, 1). Los Angeles County, Paradise Cove (LACM 66-58.6, 2). Los Angeles County, Palos Verdes Peninsula, Whites Point (LACM 146853, 4; LACM 35602, 6). Los Angeles County, San Pedro (AMNH 254140, 2; USNM 181130, 1). Los Angeles County, San Pedro, off White's Point (SBMNH 23985, 1). Los Angeles County, Portugese Bend (SBMNH 24709, 1). Los Angeles County, Santa Catalina Isl. (AMNH Edison A9853, 2). Los Angeles County, S Santa Catalina Isl., Farnsworth Bank (LACM 65-18.3, 1 with dried body; LACM 67-16.3, 1 with dried body). Orange County, Newport Beach (AMNH Edison A9853, 1; SBMNH 23131, 2). San Diego County, San Diego (LACM 70228, 2; AMNH 117368, 1). San Diego County, San Diego, 1 mile off Bird Rock (LACM 146856, 2). San Diego County, San Diego, Point Loma (LACM 23456, 2; LACM 147291, 1). San Diego County, San Diego, La Jolla (LACM 72-109.6, 4; LACM 46-16.4, 1: complete). San Diego County, San Diego, Mission Bay (AMNH Edison A9853, 2). MEXICO, BAJA CALIFORNIA: Pacific Coast, S Punta Banda, Arbolito (LACM 67-52.1, 5; LACM 63-42.7, 2). BC del Norte, Punta Banda, La Bufadora (SBMNH 40237, 2). Pacific Coast, S Puerto Santo Tomas (LACM 67-49.1, 2; LACM 67-1.10, 9). Santa Tomas Bay (SBMNH no #, 1). Bahia Tortuga (LACM 11271, 13).

Turtle Bay (= Bahia San Barolome) (AMNH 198697, 1; AMNH 254134, 1). Pacific Coast, 4 miles off Isla San Martin, Six-and-a-half Fathom Bank (LACM 71-148.3, 1). Islas Coronado, Coronado del Norte (LACM 146817, 1). MEXICO: Mazatlan (AMNH Edison A9853, 1).

LITERATURE, LOCALITIES: Farallones; S of Carmel, Yankee Point; Seaside (SMITH & GORDON, 1948). Point Loma (COX, 1960; MULLINER, 1984).

LITERATURE, RANGE: Farallon Isl. - San Diego (OLDROYD, 1927). Monterey County - San Diego (BARTSCH, 1940). Farallon Isl. - San Diego (BONNOT, 1948). Farallon Isl. - San Diego (ABBOTT, 1954). Point Conception - Turtle Bay (= Bahia San Bartholome) (COX, 1960). San Luis Obispo County - Bahia Tortugas (HAAKER *et al.*, 1986).

Haliotis roberti McLean, 1970 (Figs. 107, 109, 112, 167, 168)

COCOS ISL.: (DLG AAB 41a, 1). Near Isla Bautista, off Bahia Inutil, SE of Bahia Iglesias (LACM 151184, 2). Bahia de Chatham (AMNH 276890, 1; AMNH 232184, 5: with dried bodies).

LITERATURE, RANGE: Cocos Isl. (MCLEAN, 1971).

Haliotis rufescens Swainson, 1822 (Figs. 96, 99, 100)

CALIFORNIA: Humboldt County, Shelter Cove (LACM 70-70.4, 4). Mendocino County, Cape Mendocino (AMNH 254135, 1). Mendocino County, 60 miles S of Eureka, Shelter Cove (AMNH Jackson 1995 A9873, 1). Mendocino County, Fort Bragg (DMNH 182043, 1; AMNH 183027, 3). Mendocino County, Mendocino (ANSP 7942, 4). Mendocino County, Punta Arena (LACM 49-5.3, 42). Mendocino County, near Albion, Whitesboro Cove (LACM 49-7.3, 3). Mendocino County, near Albion, Cormorant Cove (LACM 49-4.4, 8). Mendocino County, Gualale River (USNM 543615, 3). Mendocino County, Gualala (USNM 98326, 2; USNM 98327a, 1). Mendocino County, Van Damme Beach State Park, N Little River Cove (LACM 49-8.1, 1; LACM 64-8, 1). Marin County, Point Reyes (LACM 17835, 2). Sonoma County, Fort Ross, Cementary Cove (LACM 50-11.2, 1). Sonoma County, N of Russian River, E Beach (LACM 50-6.2, 1; LACM 48-47.2, 1). Sonoma County, Bodega Head (LACM 48-5.6, 1; LACM 49-113.1, 1). Sonoma County, Bodega Bay, Horseshoe Cove (LACM 49-108.1, 4; LACM 49-38.1, 3). Sonoma County, Shell Beach (LACM 50-84.2, 7). Sonoma County, Stewart's Point (LACM 50-10.3, 8; LACM 50-7.3, 21). San Mateo County, Pillar Point (AMNH 154937, 8). San Mateo County, Moss Beach (LACM 63-1.4, 2; SBMNH 5555, 6). San Mateo County, Moss Beach, Kelp Cove (AMNH 89182, 1). San Mateo County, Franklin Point (LACM 62-8.6, 1). San Francisco County, Farallon Isl. (DMNH 111168, 1). San Francisco County, San Francisco (AMNH 19735, 1). San Francisco County, Pigeon Point (AMNH 99375, 1). San Francisco County, Purissima (USNM 98313, 1). Santa Cruz County, Grayhound Rock to Ano Neuvo Point, Waddell Beach (LACM 67-95.10, 3). Santa Cruz County, Beach near Santa Cruz (ANSP 170249, 2). Monterey County, Big Sur, S Lighthouse Rock (LACM 47-16.10, 1: complete). Monterey County, Pacific Grove (LACM 59340, 5; LACM 59-12.8, 2). Monterey County, Pacific Grove, Point Joe (LACM 146861, 1). Monterey County, Pacific Grove, Asilomar State Park (DMNH 120827, 4). Monterey County, Monterey (USNM 60433, 2; USNM 31267, 3). Monterey County, Monterey Bay, off Cannery Row and Hopkins Marine Station (LACM 60-14.4, 15). Monterey County, Carmel (ANSP 155146, 3). Monterey County, Carmel, N side of Mission Point (DMNH 035655, 1). Monterey County, N of San Jose Creek Beach, Carmel Submarine Canyon (LACM 60-24.15, 1). Monterey County, Carmel, N side of Mission Point, off Carmel River State Beach (DMNH 114896, 6; DMNH 114914, 8). Monterey County, Monterey (LACM 110621, 3; LACM 146863, 1). Monterey County, Monterey, Coast Guard Breakwater (LACM 54784, 3: complete; LACM 68-30.2, 3). Monterey County, Monterey Peninsula, Point Pinos (DMNH 036487, 1). Monterey County, Soberanes Point (LACM 64-12.1, 2). San Luis Obispo County, Piedras Blancas (DMNH 119434, 2; AMNH 220233, 4). San Simeon (AMNH 100799, 2). San Luis Obispo County, Cambria (AMNH 85472, 1; SBMNH 230, 1). San Luis Obispo County, Cambria Pines (SBMNH 23722, 2). San Luis Obispo County, N Cayucos (LACM 46-35.5, 1; LACM 77-112.4, 2). San Luis Obispo County, Cayucos, Garcia Ranch (SBMNH 46553, 1). San Luis Obispo County, Moro Bay (DMNH 010955, 4; DMNH 066020, 2). San Luis Obispo County, Moro Bay, Point Estero (AMNH 276884, 1). San Luis Obispo County, S Shell Beach (LACM 68-36.6, 1). Santa Barbara County, Point Conception (LACM 62364, 7; SBMNH 28305, 1). Santa Barbara County, 5 miles SE of Point Conception (LACM 63.39.10, 2). Santa Barbara County, Point Conception, Coho Anchorage (AMNH 198678, 1; AMNH 175668, 1). Santa Barbara County, Santa Barbara (SBMNH no #, 5). Santa Barbara County, Santa Barbara Isl. (LACM 23451, 1; ANSP 50155, 1). Santa Barbara County, Santa Barbara, Goleta (AMNH Edison A9853, 2). Santa Barbara County, Goleta, Coal Oil Point (SBMNH 231, 3; SBMNH 23447, 1). Santa Barbara County, Jalama (SBMNH 28310, 1). Santa Barbara County, off Jalama (SBMNH 28306, 1). Santa Barbara County, Tajiguas (LACM 63-36.7, 1; SBMNH 235, 1). Santa Barbara County, Santa Rosa Isl. (SBMNH 12590, 2). Santa Barbara County, S Santa Cruz Isl., W Yellowbanks (LACM 69-32.8, 1). Santa Barbara County, off San Miguel Isl., Wilson Rock (LACM 82-59.9, 2: complete). Santa Barbara County, San Miguel Isl., SE of Bay Point (LACM 67-38.8, 2; LACM 67-38.8, 1 radula + some tissue). Santa Barbara County, NW San Miguel Isl. (LACM 82-58.5, 4). Ventura County, San Nicolas Isl. (DMNH 119114, 1). Ventura County, S San Nicolas Isl. (LACM 69-14.6). Ventura County, Oxnard, Channel Isl. Marina (SBMNH 179, 1). San Clemente Isl. (AMNH 220234, 2). San Clemente Isl. (AMNH 83987, 1). Off Anacapa Isl. (SBMNH no #, 6). Los Angeles County, N Malibu (AMNH 240637, 2). Los Angeles County, off San Pedro (LACM 18156, 1). Los Angeles County, San Pedro (AMNH 100800, 1; ANSP 50507, 2). Los Angeles County, Pt. Fermin Lighthouse (LACM 55-24.5, 1). Los Angeles County, Catalina Isl. (AMNH 71334, 3). Los Angeles County, off Catalina Isl.

(SBMNH 28151, 1). Los Angeles County, W Santa Catalina Isl. (LACM 146841, 2). Los Angeles County, Paradise Cove (LACM 66-58.7, 1). White's Point (SBMNH 177, 1). Orange County, Newport Bay (AMNH 121687, 1; AMNH 198675, 2). Orange County, Corona del Mar (SBMNH 13689, 1). Orange County, Laguna Beach (MHNG 21807, 2). San Diego County, Del Mar (AMNH Jackson 1995 A9873, 2). San Diego County, La Jolla (LACM 72-109.7, 2; AMNH Jackson, 1995 A9873, 4). San Diego County, La Jolla, Bird Rock (SBMNH no #, 5). San Diego County, Point Loma (SBMNH no #, 1; SBMNH no #, 2). San Diego County, San Diego (ANSP 50506, 2; USNM 522562, 2). MEXICO, BAJA CALIFORNIA: N Baja, Ensenada (AMNH 284471, 2; 284470, 3). Pacific Coast, Punta Banda (LACM 63-42.8, 2; SBMNH no #, 2). Pacific Coast, S of Punta Banda, Arbolito (LACM 67-47.6, 5; LACM 67-53.4, 3). Punta Banda, Kennedy Cove (SBMNH no #, 1). Punta Santa Tomas (SBMNH no #, 2). Pacific Coast, 18.5 miles W of Santo Tomas, Puerto Santo Tomas (LACM 67-46.9, 1 + 1 with dried body; LACM 67-1.11, 2). E of Cedros Isl. (AMNH 97182, 1). Pacific Coast. S of Isla San Geronimo (LACM 71-91.9, 2). Pacific Coast, E Isla San Geronimo (LACM 67-61.9, 1).

LITERATURE, LOCALITIES: California, Crescent City (Bonnot, 1930). Between Piedras Blancas and San Simeon; S White Rock No. 1; S Harlan Rock; N Carmel Bay; S Point Conception; NE and SW San Miguel Isl.; N Pt. San Luis; 5 miles N Point Estero (Bonnot, 1940). Point Hueme (Friedman *et al.*, 1993). Santa Cruz Isl. (Davis *et al.*, 1996).

LITERATURE, RANGE: Bodega Bay - La Paz (Oldroyd, 1927). Mendocino County and S (Bartsch, 1940). N CA, Point Saint George - La Paz (Bonnot, 1948). Oregon, Sunset Bay - Turtle Bay (= Bahia San Bartholome) (Cox, 1960). Oregon, Sunset Bay - Bahia Tortugas (Haaker *et al.*, 1986).

Haliotis sorenseni **Bartsch, 1940 (Figs. 100, 101, 104)**

CALIFORNIA: San Luis Obispo County, Moro Bay (LACM 146852,10; DMNH 095517, 1). Santa Barbara County, off Point Conception (LACM 67901, 1). Santa Barbara County, N Point Conception (DMNH 034815, 1). Santa Barbara County, S of Point Conception (LACM H-3418, 1). 18 miles S of Point Conception (LACM 146867, 1). Santa Barbara County, Santa Barbara Isl. (LACM 17834, 1). Santa Barbara County, off Santa Barbara Isl. (SBMNH 16192, 1; SBMNH 18826, 1). Santa Barbara County, E Santa Barbara Isl. (LACM 72-97.9, 5). Santa Barbara County, Santa Cruz Isl., off Smugglers Cove (AMNH 175672, 1; SBMNH 28303, 1). Santa Barbara County, S Santa Cruz Isl., W of Yellowbanks (LACM 69-32.9, 5). Santa Barbara County, off Santa Cruz Isl. (SBMNH 18902, 1). Santa Barbara County, Santa Cruz Isl., Pinnacle reef (SBMNH no #, 1). Santa Barbara County, Santa Rosa Isl. (SBMNH 166, 1). Ventura County, Point Hueme, Harbor (AMNH 240640, 1). Los Angeles County, off Point Dume (LACM 146868, 1). Los Angeles County, Palos Verdes, off Malaga Cove (DMNH 118516, 1). Los Angeles County, Tanner Bank (LACM 69-35.4, 2). Los Angeles County, off San Pedro (LACM 17823, 2). San Clemente Isl. (LACM 146865, 1; LACM 21843, 1). S San Clemente Isl. (AMNH 198785, 1; MNHN no #, 1). SE tip of San Clemente Isl., Pyramid Point (LACM 69-29.14, 1). Anacapa Isl. (AMNH 198774, 2). S Anacapa Isl. (LACM 64-28.7, 1). Los Angeles County, Santa Catalina Isl., Emerald Bay (LACM 146866, 1). Los Angeles County, SW Santa Catalina Isl., Ironbound Cove (LACM 69-31.10, 1). Los Angeles County, S Santa Catalina Isl., Isthmus, Bird Rock (AMNH 198786, 1). Los Angeles County, W end Catalina Isl. (LACM 68-25.8, 2; LACM 68-25.8, 1). Los Angeles County, off S Catalina Isl., Farnsworth Bank (LACM 70-27.4, 1; LACM 67-16.4, 4). Channel Isl., Cortes Bank, S of Bishop Rock (LACM 69-34.8, 2). Orange County, Newport Beach (ANSP 252572, 1; AMNH 240639, 1). San Diego County, Point Loma (SBMNH no #, 1). MEXICO, BAJA CALIFORNIA, PACIFIC COAST: S of San Diego, Isla Coronados (LACM 71-98.6, 1). S of Ensenada (LACM 146870, 1). Punta Banda, La Bufadora (SBMNH 6190, 1). S Punta Banda (LACM 67-53.5, 8; 67-44, 1). SW Isla Natividad (LACM 72-117.9, 1). Isla Natividad, 1 ml. SW of Twelve Fathom Bank (LACM 71-165.6, 9). Bahia San Bartolome, near Kelp Point (LACM 54-13.4, 3). N end of Ila San Geronimo (LACM 67-62.6, 1). Punta San Pablo (LACM 71-178.13, 8). E Isla San Martin, Hassler Cove (LACM 68-31.6, 2). Isla San Martin, South Anchorage (LACM 67-60.7, 1). Isla Asunción, E anchorage (LACM 67-66, 3). Isla Cedros (LACM 71-156.6, 1; AMNH 254137, 1). Thurloe Head (LACM 71-170.8, 2). Punta Rompiente (LACM 71-161.9, 5). San Felipe (DMNH 111162, 1).

LITERATURE, LOCALITIES: N Point Conception; San Diego; Santa Cruz Isl. (Cox, 1960). Isla Guadalupe (Chace, 1966).

LITERATURE, RANGE: Point Conception - Asuncion Isl. (McLean, 1978). Point Conception - Bahia Tortugas; Channel Isl. (Haaker *et al.*, 1986).

Haliotis walallensis **Stearns, 1898 (Figs. 100, 102, 105, 173)**

WASHINGTON: Abalone Point, near Westport (AMNH 182797, 1; SBMNH 2943, 1). OREGON: Coos County, Coos Bay (LACM 42-34.2, 1). CALIFORNIA: Del Norte County, Crecent City (USNM 104142, 5). Humboldt County, Eureka (DMNH 012826, 1; AMNH 220266, 1). Humboldt County, Shelter Cove (LACM 70-70, 1). Sonoma County, Fort Ross (SBMNH 43470, 2). Sonoma County, 0.5 miles S of Fort Ross (LACM 63-57.3, 2). Sonoma County, Bodega Bay, Stewart's Point (LACM 50-7.9, 7; 112722, 5). Sonoma County, out of Bodega Bay (DMNH 11246, 1). Sonoma County, N Russian River, E beach (LACM 48-49.2, 1). Sonoma County, Salt Point Ranch (LACM 64-6.3, 5; LACM 64-20.3, 6). Mendocino County, Fort Bragg (DMNH 112644, 1; ANSP 257076, 2). Mencocino County, S entrance Noyo Anchorage (LACM 71-140.1, 1). Mendocino County, Albion (LACM 62-15, 4; SBMNH 10331, 3). Mendocino County, near Albion, Cormorant Cove (LACM 49-4.8, 2). Mendocino County, near Albion, Witesboro Cove (LACM 49-7.4, 3). Mendocino County, Punta Arena (LACM 146873, 1; LACM 49-5.4, 3). Mendocino County, Gualala (AMNH 100830, 1; USNM 635437, 1). Mendocino County, Mendocino, Agate Beach (SBMNH 43472, 3). Mendocino County, Little River, Van

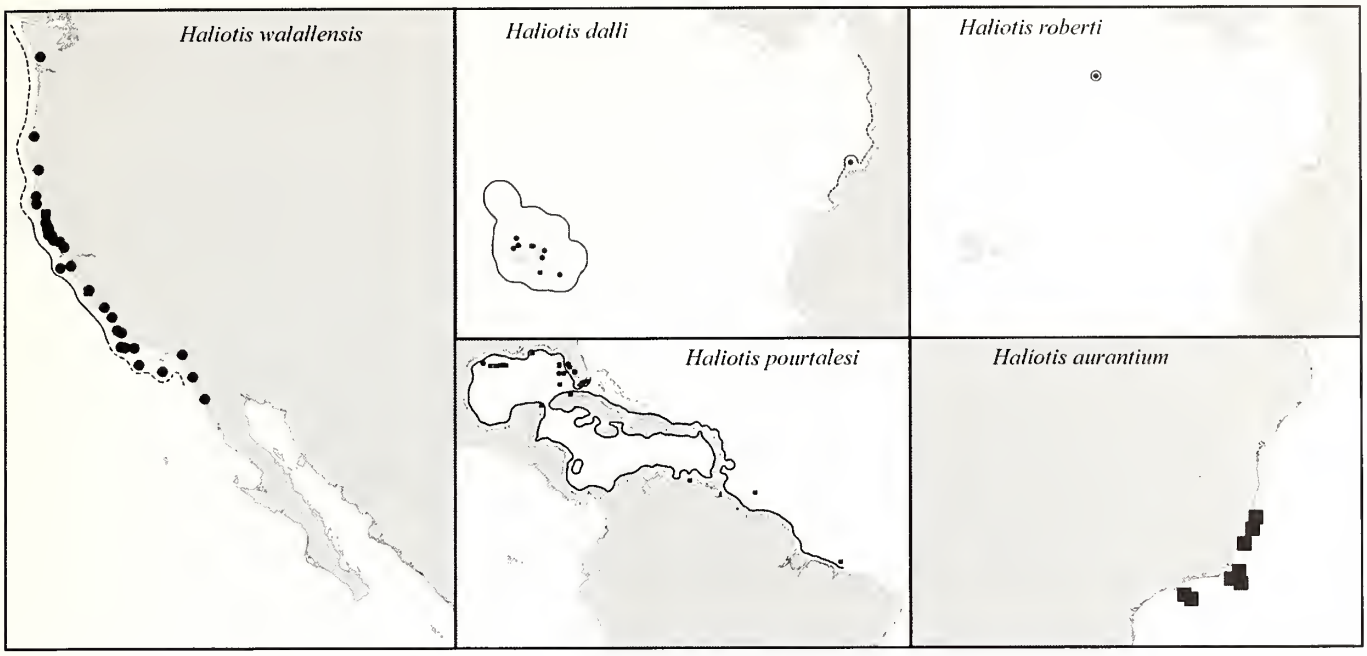


Fig. 107. Distribution of east Pacific (II), tropical Pacific, and western Atlantic species of *Haliotis* spp. For data see text. Localities stemming from collection specimens are indicated with a solid circle, those from the literature with a solid square.

Damne State Park (LACM 64-9.1, 2; LACM 64-8.4, 1). Monterey County, 11 miles S of Pacific Grove, off Nankee Point (AMNH 140003, 2). Monterey County, off Carmel River state beach (DMNH 074501, 5). San Francisco County, SE Farallon Isl. (LACM 62-9.6, 3). San Mateo County, Moss Beach (DMNH 034748, 1). San Luis Obispo County, N Point Buchon, Montana de Oro state park (DMNH 112654, 1). San Luis Obispo County, San Simeon (AMNH 198686, 1). Santa Barbara County, Arguello, Jalama Park (AMNH 220265, 1). Santa Barbara County, off Point Conception (DMNH 112154, 1). Santa Barbara County, Coho Anchorage, Point Conception (DMNH 111980, 2). Santa Barbara County, Santa Cruz Isl. (SBMNH 18904, 1). Santa Barbara County, Santa Rosa Isl., W end (USNM 877515, 1). Santa Barbara County, Santa Rosa Isl., Ford Point (SBMNH 6140, 1). Santa Barbara County, Santa Rosa Isl., Hohnson's Lee (AMNH 198691, 1). Santa Barbara County, San Miguel Isl. (SBMNH 23853, 2). Ventura County, San Nicolas Isl. (AMNH 254138, 2). San Clemente Isl. (AMNH 220263, 2). Orange County (MHNG ex 13166, 1). San Diego County, San Diego (AMNH 220264, 1). San Diego County, La Jolla (SBMNH 23676, 1). San Diego County, San Diego, Mission Bay (AMNH Edison A9853, 1; AMNH 240644, 1). MEXICO: Baja California, Bahin Todos Santa (DLG AAB 38a, 1).

LITERATURE, LOCALITIES: Abalone Point near Westport (Bonnot, 1930). Hopkins Marine Station, Point Cabrillo (Lowry & Pearse, 1973).

LITERATURE, RANGE: Westport - Point Conception (Bonnot, 1948; Abbott, 1954). British Columbia - S California (Abbott & Dance, 1983). British Columbia - San Diego (Haaker *et al.*, 1986).

Western Atlantic Species (Figs. 107, 108, 111, 114, 115)

Haliotis aurantium Simone, 1998 (Figs. 107, 108, 111)

LITERATURE, LOCALITIES: São Paulo, off Ubatuba, 24° 07' S 44° 06' W; Amapá, off Cabo Orange, Brazil; off Vitória, Espirito Santo, Brazil; Espirito Santo, E of Ponta do Ubú, 21° 05' S 41° 19' W; Rio de Janeiro, 21° 56' 05" S 40° 07' 00" W; Rio de Janeiro, off Cabo Frio, 23° 05" S 40° 05' W; Rio de Janeiro, off Campos Bay, 22° 06' 06" S 40° 08' 38" W (type locality); Rio de Janeiro, off Cabo de São Tomé, 22° 27' 06" S 40° 30' W; Rio Grande do Sul; off Conceição (Simone, 1998). Between Vitoria and Salvador, Baja, 20° 10' 0" S 39° 49' 3" W (Silva & Guerra, 1968: *fide* Klappenbach, 1968: as *barbouri*). Off Vitória, E. S.; Off Santos (Rios, 1975). (Rios, 1975, 1985, 1994) San Pablo, 24° 18' S 44° 50' W; 24° 20' S 44° 40' W (Klappenbach, 1968: as *pourtalesii*).

Haliotis pourtalesii Dall, 1881 (Figs. 107, 114, 115)

USA: Texas, 185 km SSW of Galveston, West Flower Garden Bank (LACM 71-359.1, 2). Florida, Petersburg (AMNH 100599, 1). Florida, Anna Maria Isl. (AMNH 244314, 3). Florida, Lee County, W Fort Myers (DMNH 103228, 2). Florida, Lee County, 90 miles W Fort Myers, 90 fms (AMNH 107598). Florida, SW of Egmont Key (420 m) (DMNH 103239, 2; AMNH 194257, 1). Florida, Key Largo, 5.5 miles SE "marker B" at Elbow, 9-100 fms (AMNH 125538, 1). Florida, Sombrero Light (AMNH Edison A9853, 1). Florida, off Sand Key, S by E 85 fms, Eolis Station 338 (USNM 333715, 2). 25° 16' 55" N 83° 37' 47" W (USNM 833627, 1).

LITERATURE, LOCALITIES: Key Largo, 3 miles of Sand Key, approximately 90 fms (Foster, 1946). Florida, 6 miles E of Sombrero (Aguayo & Jaume, 1947). NE Yuctan Peninsula,

21° 21' N 86° 30' W (HARRY, 1966). Cuba, Havana (SARASUA, 1968). 24° 57' N 83° 40' W (GUICE, 1968). E of Mississippi Delta, 29° 20' N 87° 46' W (JUNG, 1968). Off Suriname, 7° 35' N 56° 52' W (NIJSSEN-MEYER, 1969). Brazil, Off Maranhao; West Flower Garden Bank, 27° 52' N 83° 40' W; off SW Florida, 27° 47' N 83° 40' N; 28 Fathom Bank, 27° 53' N 93° 27' W; Little Sister Bank, 27° 52'N 94° 15' W; Sidner Bank, 27° 57' N 92° 22' W; Alderdice Bank, 28° 04' N 91° 59' W; Elvers Bank, 27° 50'N 92° 53' W; Rezak Bank, 27° 55' N 92° 23' W (TITGEN & BRIGHT, 1985). Venezuela, N State of Anzoátegui, S Isla Tortuga (MARTINEZ & RUIZ, 1994).

LITERATURE, RANGE: Off Lower Florida Keys (ABBOTT, 1954). SE United States - Brazil (ABBOTT & DANCE, 1983).

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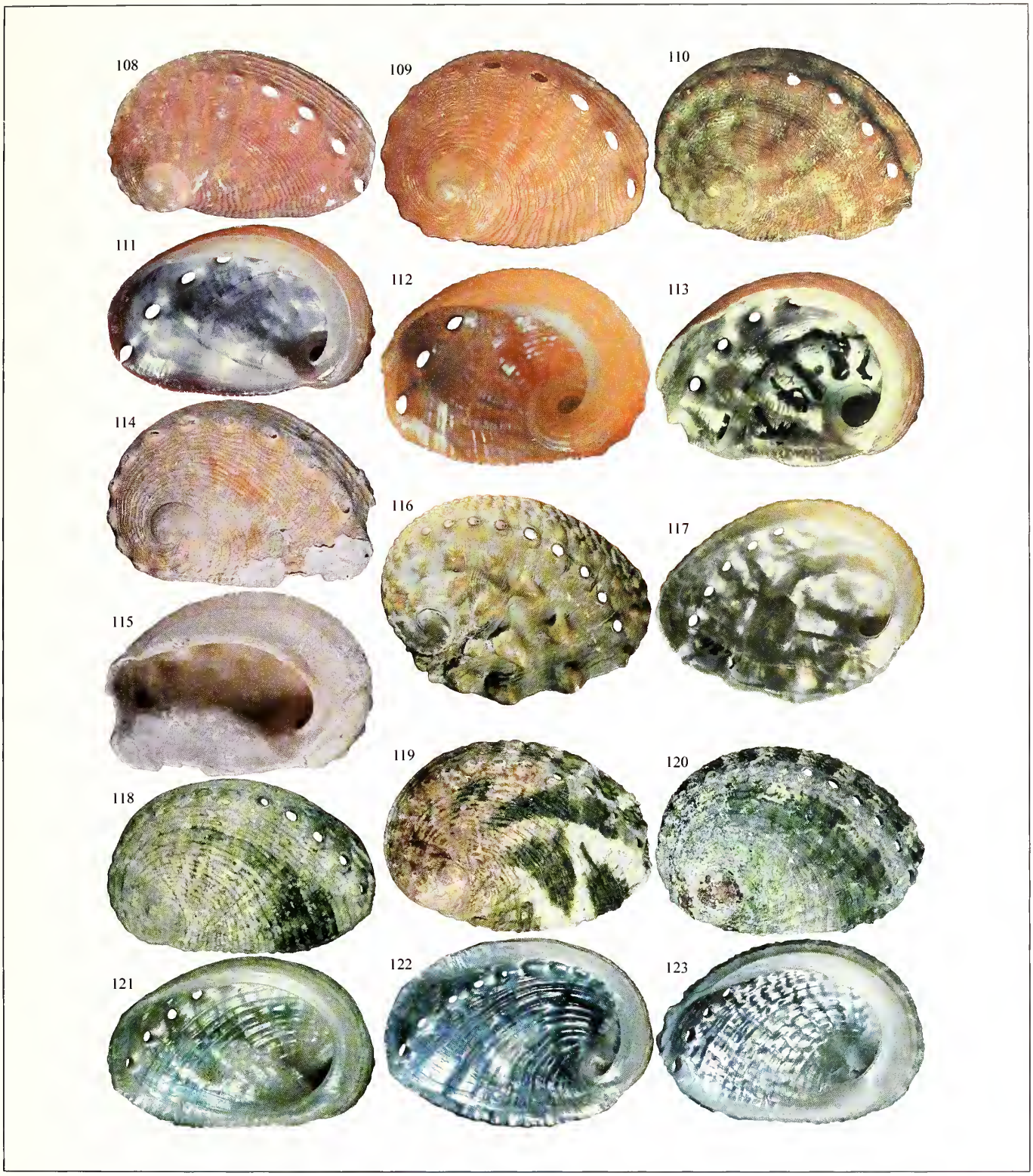
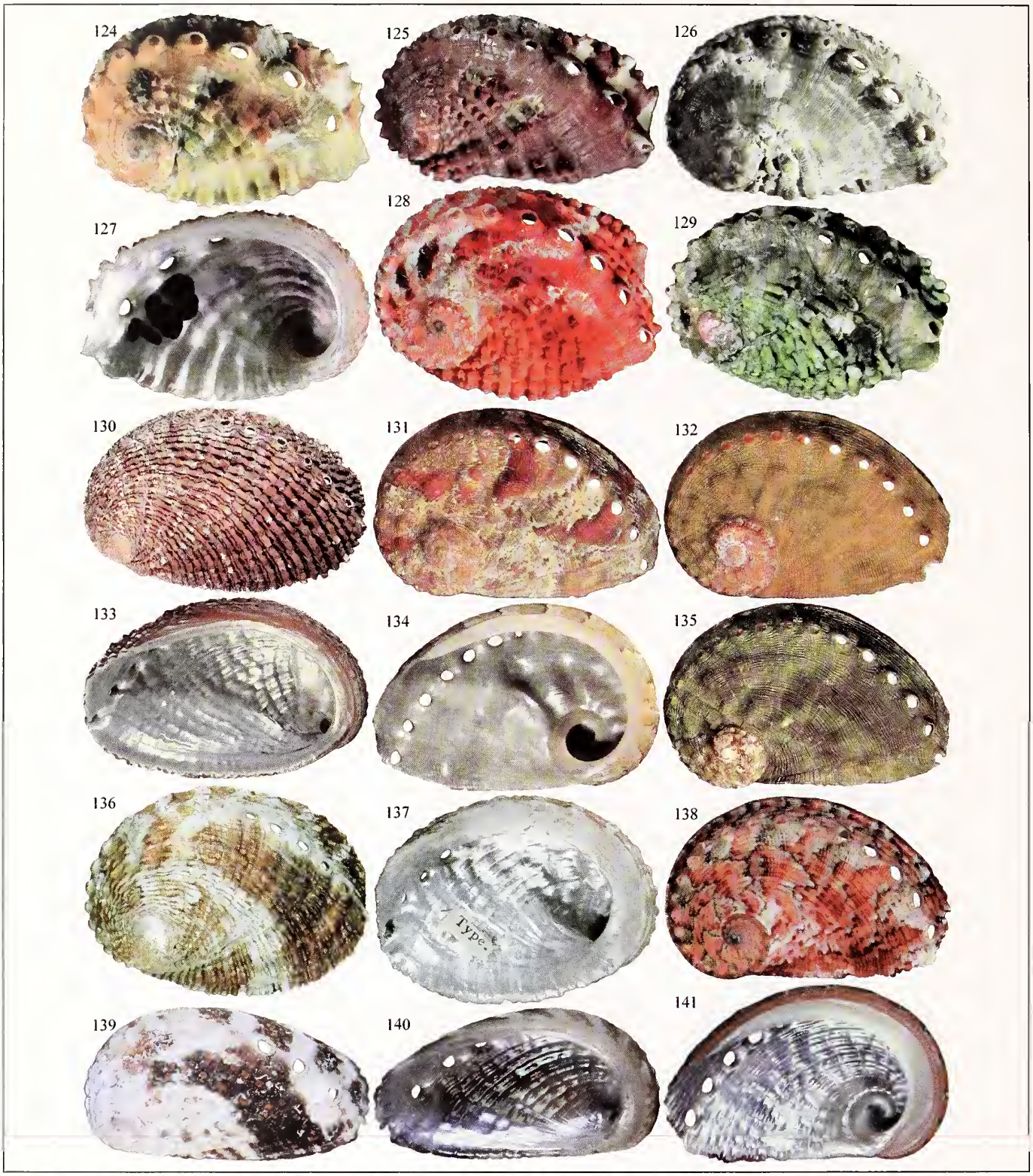
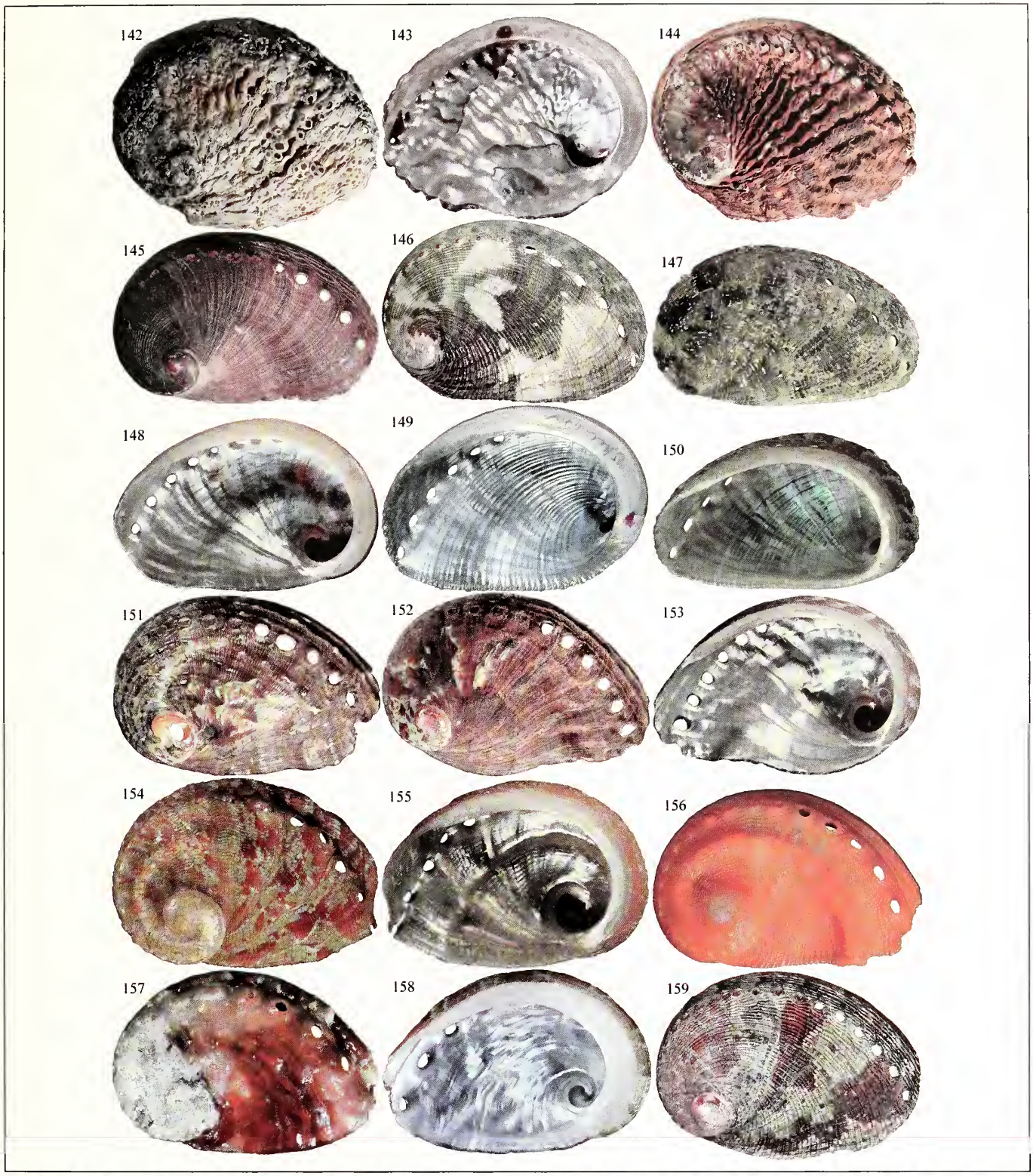


Figs. 108, 111. *Haliotis aurantium* Simone, 1998. MZUSP28.391, paratype. "À leste da ponta do Umbú, ES [Espiritu Santo: = province] +/- 48 m, mergulho autônomo, sobre Laminaria abussalis. Eurico Cabral de Oliveira Fo. col. 14/x/1986." 16 mm. Figs. 109, 112. *Haliotis roberti* McLean, 1970. DLG AAB 41a. Cocos Island. 11 mm. Figs. 110, 113. *Haliotis dalli* Henderson, 1915. LACM 72-197.7. Punta Espinosa, Isla Fernandina (Narborough), Galapagos. Leg. Richard M. Lease, RV SEARCHER. 25. I. 1972. Intertidal, lava tidepools. 27 mm. Figs. 114, 115. *Haliotis pourtalesii* Dall, 1881. LACM 71-359.1. West Flower Garden Bank, 185 km SSW of Galveston, Texas. 10 mm. Figs. 116, 117. *Haliotis fatui* Geiger, 1999. USNM 487953. Tonga. 30 mm. Figs. 118, 121. *Haliotis exigua* Dunker, 1877. NMW 1955.158.2133. Japan. 21 mm. Figs. 119, 122. *Haliotis planata* Sowerby, 1882. Fig. 119. NMW 1955.158.2124. Philippines. 39 mm. Fig. 122. NMW 1955.158.2125. Guadalcanal, Solomon Islands. 33 mm. Figs. 120, 123. *Haliotis dohrniana* Dunker, 1863. DLG AAB 49a. Brony, New Caledonia. 43 mm.



Figs. 124 - 129. *Haliotis jacnensis* Reeve, 1846. Note scales from suture but not entirely reaching row of tremata with width of bare space being variable. The coloration of the shell is extremely variable. Figs. 124, 127. RP no #. No locality. 12 mm. Dorsal and ventral. Fig. 125. DLG AAB 45f. 1,000 Islands group, Bay of Jakarta, near Java, Indonesia. 28 mm. Dorsal view of elongated specimen. Fig. 126. USNM 423136. Lifu. 15 mm. Dorsal with wide bare space between scales and row of tremata. Fig. 128. DLG AAB 45e. N. Samar, Philippines. 19 mm. Dorsal view of round specimen. Fig. 129. RP no #. New Britain. 20 mm. Dorsal. Figs. 130, 133. *Haliotis squamosa* Gray, 1826. DLG AAB 33c. Between Fort Dauphin and Monantenina, Madagascar. 83 mm. Leg. Marc Girona (Tahiti). Col. Carmen & Michel Blanchard (1960 - 1965). Figs. 131, 132, 134, 135. *Haliotis semiplicata* Menke, 1843. This species displays a wide array of colors. Figs. 131, 134. DLG AAB 11a. Garden Island, Western Australia. 38 mm. Red color form, dorsal and ventral. Fig. 132. DLG AAB 11k. Rottnest Island, Western Australia. 35 mm. Yellow color form. Fig. 135. DLG AAB 11g. No locality. 50 mm. Green color form. Figs. 136, 137. *Haliotis rubiginosa* Reeve, 1846. BMNH type collection. Type locality: "?". 43 mm. Figs. 138, 141. *Haliotis clathrata* Reeve, 1846. RP. South New Caledonia. 29mm. Figs. 139, 140. *Haliotis dissona* (Iredale, 1929). JK. Site 142, Astrolabe Reef, Fiji. 17 mm.



Figs. 142 - 145, 148. *Haliotis midae* Linnaeus, 1758. Figs. 142, 143. DLG AAB 8b. Simons Town, False Bay, South Africa. 95 mm. Dorsal and ventral view of white west coast variation. Fig. 144. DLG AAB 08d. Port Alfred, South Africa. Dorsal view of dark east coast variation. Figs. 145, 148. DLG AAB 08c. No locality data. Dorsal and ventral of juvenile; note marked contrast in sculpure and red tinge in nacre near spindle. Figs. 146, 149. *Haliotis marmorata* Linnaeus, 1758. NMW. "Cape of Good Hope" [doubtful locality]. 44 mm. Dorsal and ventral view. Figs. 147, 150. *Haliotis stomatiaeformis* Reeve, 1846. DLG AAB 51a. Malta Island. Dorsal and ventral view. Figs. 151-153. *Haliotis spadicea* Donovan, 1808. Fig. 151. DLG AAB 12d. No locality data. 21 mm. Dorsal view of juvenile specimen. Figs. 152, 153. DLG AAB 12c. Muizenberg , False Bay, South Africa. 66 mm. Dorsal and ventral view of adult. Figs. 154- 156. *Haliotis parva* Linnaeus, 1758. Figs. 154, 155. DLG AAB 18g. Tanskei, South Africa. 32 mm. Dorsal and ventral view of typically mottled specimen. Fig. 156. DLG AAB 18. Cape Town, South Africa. 19 mm. Dorsal view orange color variation. Figs. 157, 158. *Haliotis unilateralis* Lamarck, 1822. MHNG 18020: neotype. Elat, Sinai, Israel. 33 mm. Dorsal and ventral view. Specimen with flat dorsal surface and pronounced ledge. Compare to Fig. 23 for an other specimen. Fig. 159. *Haliotis speciosa* Reeve, 1846. NMW. Algoa Bay. 30 mm. Dorsal.

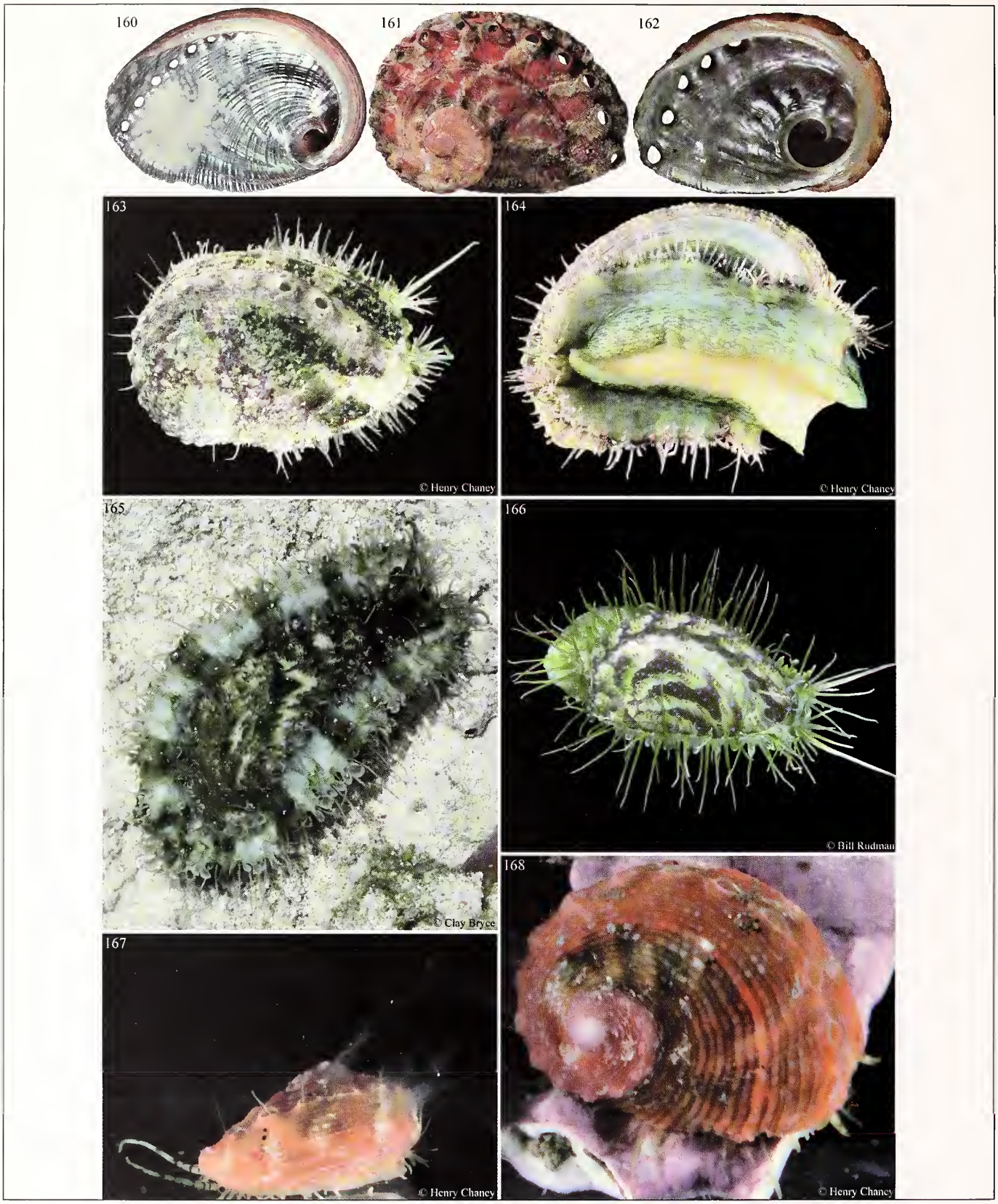


Fig. 160. *Haliotis speciosa* Reeve, 1846. NMW. Algoa Bay, South Africa. 30 mm. Ventral. Figs. 161, 162. *Haliotis queketti* Smith, 1910. DLG AAB 52a. Coffee Bay, Transkei, South Africa. 29 mm. Figs. 163, 164. *Haliotis varia* Linnaeus, 1758. Lompok, Indonesia. IV 1988. Photographs and © Henry Chaney. Fig. 163. Dorsal. Fig. 164. Ventral. Fig. 165, 166. *Haliotis asinina* Linnaeus, 1758. Fig. 165. Ashmore Reef, Timor Sea. Photograph and © Clay Bryce. Adult specimen. Fig. 166. Heron Island, Queensland, Australia. June 1983. Photo #100560/61. Photograph and © Bill Rudman. Juvenile specimen. Figs. 167, 168. *Haliotis roberti* McLean, 1970. Bahia Wafer, Isla del Coco, Costa Rica. II 1991. Photographs and © Henry Chaney. Fig. 167. Lateral view of spawning specimen. Fig. 168. Dorsal view, on coralline algae.

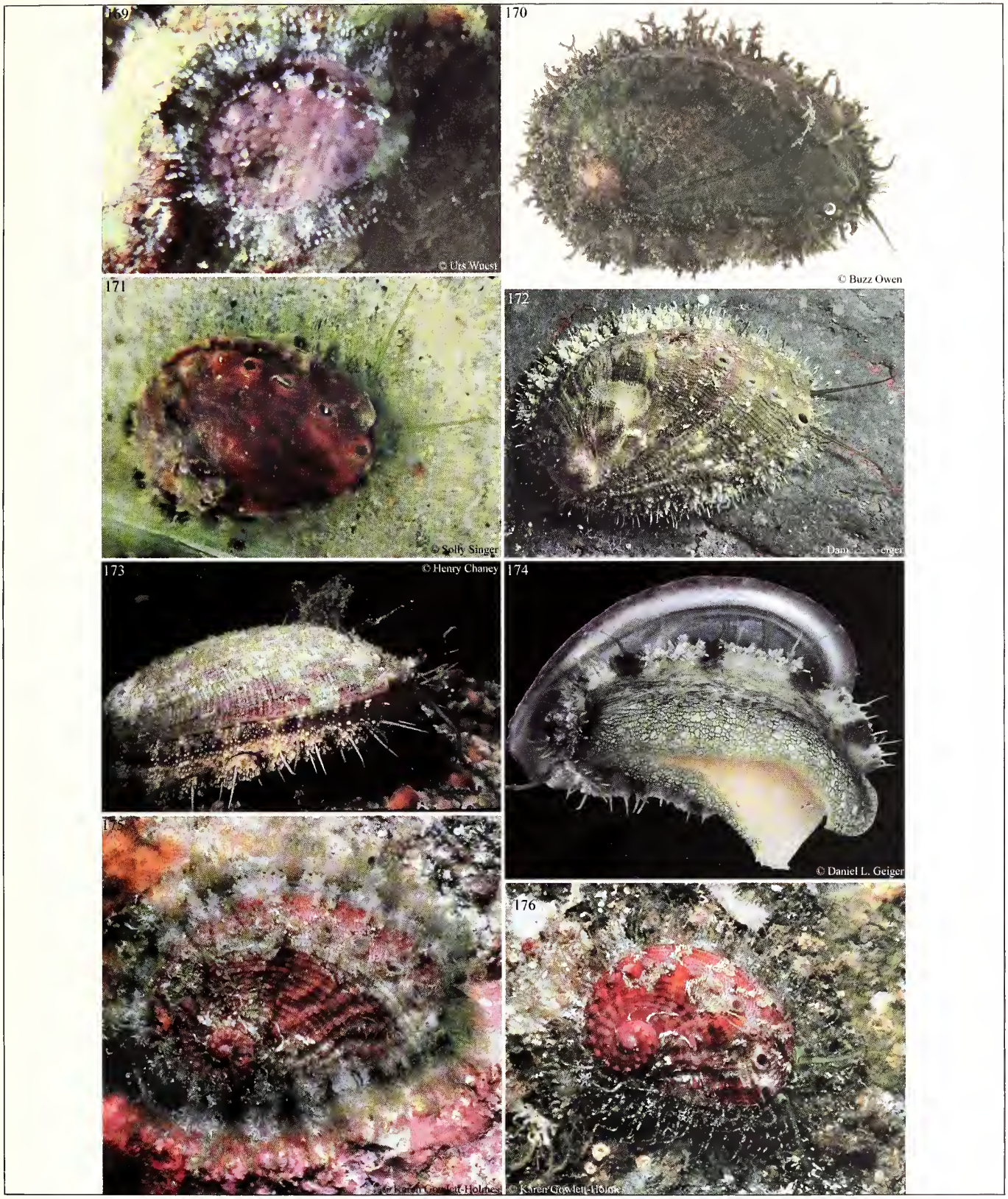
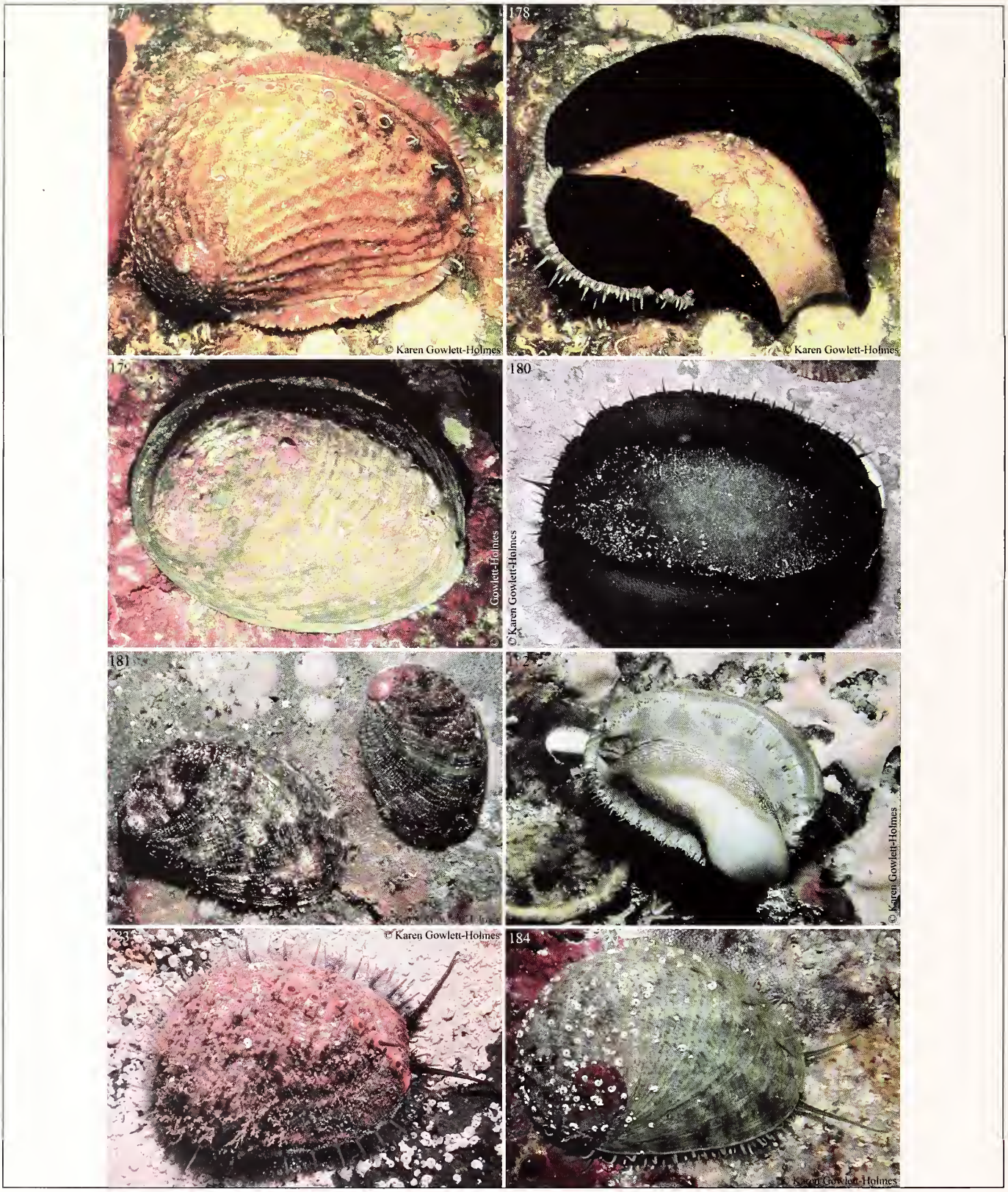


Fig. 169. *Haliotis unilateralis* Lamarck, 1822. Hurghada, Egypt. 3-4 m under stone at the foot of a coral reef. Photograph and © Urs Wuest. Fig. 170. *Haliotis* sp. nov. (Owen et al., in prep.). Greece. Photograph and © Buzz Owen. Fig. 171. *Haliotis unilateralis* Lamarck, 1822. Elat, Israel. Neotype MHNG 18020. Photograph and © Solly Singer. Fig. 172. *Haliotis tuberculata*.Linnaeus, 1758. Illa d'en Colom, Menorca, Balearic Islands, Spain. 11 m. VII-VIII 1989. Slide #370. Photograph and © Daniel L. Geiger. Fig. 173. *Haliotis fulgens* Philippi, 1845. Adult specimen in situ, off Monterey, California. Photograph and © Henry Chaney. Fig. 174. *Haliotis tuberculata* Linnaeus, 1758. Banyuls-sur Mer, France. Slide #87. Photograph and © Daniel L. Geiger. Righting behavior. Figs. 175, 176. *Haliotis clathrata* Reeve, 1846. Tulamben, Bali, Indonesia. Under a rock. Photographs and © Karen Gowlett-Holmes. Two specimens shown.



Figs. 177, 178. *Haliotis australis* Gmelin, 1791. Stewart Island, New Zealand. Photographs and © Karen Gowlett-Holmes. Fig. 177. Under rock, dorsal. Fig. 178. Ventral, showing the white sole of the foot. Figs. 179, 180. Haliotis iris Gmelin, 1791. Photographs and © Karen Gowlett-Holmes. Fig. 179. Wellington, North Island, New Zealand. Dorsal. Fig. 180. Stewart Island, New Zealand. Ventral, showing the black sole of the foot. Figs. 181, 182. *Haliotis virginea* Gmelin, 1791. Photographs and © Karen Gowlett-Holmes. Fig. 181. Porirua, North Island, New Zealand. Two specimens dorsal, under rock. Fig. 182. Milford Sound, South Island, New Zealand. Ventral, showing pale white sole of foot. Fig. 183. *Haliotis rubra* Leach, 1814. Lagoon Bay, Tasmania, Australia. dorsal under a rock. Photograph and © Karen Gowlett-Holmes. Fig. 184. *Haliotis laevigata* Donovan, 1808. Duke of Orleans Bay, Western Australia, Australia. Under a rock. Photograph and © Karen Gowlett-Holmes.

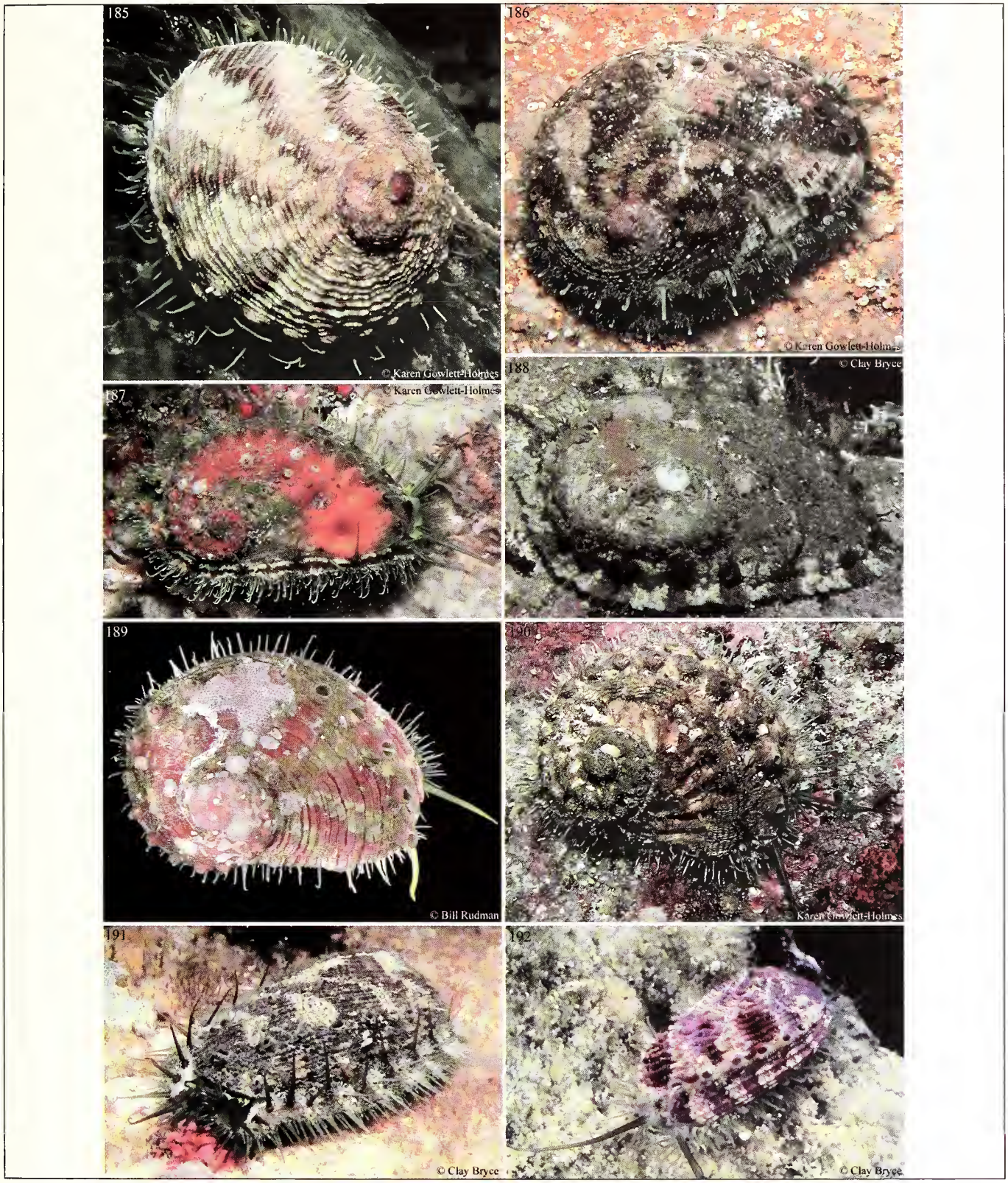


Fig. 185. *Haliotis cyclobates* Péron & Lesueur, 1816. Edithburgh, South Australia, Australia. On Pinna bicolor Gmelin, 1791, its usual habitat. Photograph and © Karen Gowlett-Holmes. Fig. 186. *Haliotis coccoradiata* Reeve, 1846. Malabar Bay, New South Wales, Australia. Under a rock. Photograph and © Karen Gowlett-Holmes. Fig. 187. *Haliotis semiplicata* Menke, 1843. Cockburn Sound, Western Australia, Australia. Under a rock. Photograph and © Karen Gowlett-Holmes. Fig. 188. *Haliotis roei* Gray, 1826. Albany, Western Australia. Photograph and © Clay Bryce. Fig. 189. *Haliotis hargravesi*. Split Solitary Island, northern New South Wales, March 1986. AMS C150035. Dorsal, photo #025409. Photograph and © Bill Rudman. Fig. 190. *Haliotis scalaris* Leach, 1814. Duke of Orleans Bay, Western Australia, Australia. Under a rock. Photograph and © Karen Gowlett-Holmes. Fig. 191. *Haliotis squamata* Reeve, 1846. Dampier Archipelago, Western Australia. Photograph and © Clay Bryce. Fig. 192. *Haliotis elegans* Philippi, 1844. Rottnest Island, Western Australia. Photograph and © Clay Bryce.

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a cura di Francesco Pusateri

ABSTRACT: l'indice é stato compilato in ordine alfabetico specifico, facendo seguire il nome generico. I seguenti simboli indicano: £= fossile; ° = sottogenere, # = non molluschi, *cd = cartina di distribuzione; *fc = foto colori; *fb = foto bianco e nero; *ai = disegno anatomia; *air = disegno radula; *me = disegno morfologia esterna; *gr = grafico; *semc = morfologia conchiliare al microscopio elettronico a scansione; *semr = morfologia radulare al microscopio elettronico a scansione.

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